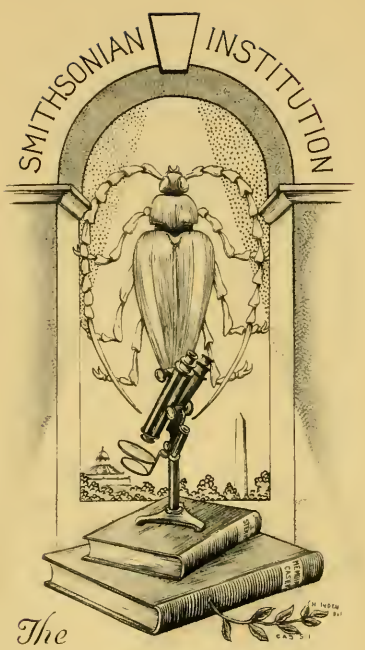

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Page 39, last line, for *fodicus* read *fodiens*.
Page 40, last line, for *etaoni* read *eatoni*.
Page 70, line 17 from bottom, *for* Hourath *read* Honrath.
Page 87, line 9 from bottom, for *Gymonpleurus* read *Gymnopleurus*.
Pages 191, 195, 196, 197, 199, *for* band *read* brand.
Page 263, line 24 from top, *for* Caucathal *read* Cauca Valley.
Page 272, line 22 from top, *for* Carilla *read* Carrillo.
Page 352, line 16 from top, *for* PRASONOTUS RUFICANDIS *read* PRASONOTUS RUFICAUDIS.
Page 463, line 12 from bottom, *for* Columbia *read* Colombia.
Page 473, line 2 from bottom, for *Laelia* read *Lælia*.
Page 648, line 13 from top, for *Astatus* read *Astata*.
Page 733, line 3 from bottom, *for* Zeitschrift *read* Zeitung.

PROCEEDINGS.

Page liv, line 4 from top, for 4-*Fasciata* read 4-*fasciata*.
Page liv, line 11 from bottom, *for* Gangelbauer *read* Ganglbauer.
Page lxxx, lines 18, 21 from top, *for* Chærocampid *read* Chœrocampid.

THE

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OF

LONDON

FOR THE YEAR

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LONDON:

PRINTED FOR THE SOCIETY BY RICHARD CLAY AND SONS, LIMITED,
LONDON AND BUNGAY.

SOLD AT THE SOCIETY'S ROOMS, 11, CHANDOS STREET,
CAVENDISH SQUARE, W.,

AND BY LONGMANS, GREEN, AND CO.,
PATERNOSTER ROW, E.C.; AND NEW YORK.

1904–1905.

DATES OF PUBLICATION IN PARTS.

Part I. (TRANS., pp. 1–158, PROC., i–xxiv) was published 27th April, 1904

„ II. („ 159–328, „ xxv–xxxvi) „ 15th June, „

„ III. („ 329–676, „ xxxvii–xlviii) „ 30th Sept., „

„ IV. („ 677–750, „ xlix–lxxx) „ 23rd Dec., „

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1895 Studd, E. F., M.A., B.C.L., *Oxton, Exeter.*
1903 Swale, Harold, M.B., *Arawa House, Rotorua, New Zealand.*
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1884 Swinhoe, Colonel Charles, M.A., F.L.S., F.Z.S., 42, *Campden House Court, Campden Hill,* W.
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1892 Thornley, The Rev. A., M.A., F.L.S., *South Leverton Vicarage, Lincoln.*
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1895 Tunaley, Henry, 13, *Beemere-road, Streatham,* S.W.
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1893 Turner, Henry Jerome, 98, *Drakefell-road, St. Catherine's Park, Hatcham,* S.E.
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1886 Tutt, James W., *Rayleigh Villa, Westcombe Hill,* S.E.
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1893 Urich, Frederick William, *Port of Spain, Trinidad, British West Indies.*

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1897 Vice, William A., M.B., 19, *Belvoir-street, Leicester.*

1895 Wacher, Sidney, F.R.C.S., *Dane John, Canterbury.*
1901 Waddington, John, *Park Holme, Harehill-avenue, Leeds.*

1899 Wade, Albert, 20, *Frenchwood-street, Preston, Lancashire.*
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1878 Walker, James J., R.N., F.L.S., *Aorangi, Lonsdale-road, Summer Town, Oxford.*
1863 † Wallace, Alfred Russel, D.C.L., Oxon., F.R.S., F.L.S., F.Z.S., *Broadstone, Wimborne, Dorset.*
1866 † Walsingham, The Right Honble. Lord, M.A., LL.D., F.R.S., F.L.S., F.Z.S., High Steward of the University of Cambridge, *Merton Hall, Thetford* ; and 66*a*, *Eaton-square,* S.W.
1886 Warren, Wm., M.A., 61, *Wilton-avenue, Chiswick-lane,* W.
1869 Waterhouse, Charles O., *Ingleside, Avenue-gardens, Acton,* W. ; and *British Museum (Natural History), Cromwell-road,* S.W.
1901 Waterhouse, Gustavus A., B.Sc., F.C.S., *Royal Mint, Sydney, New South Wales, Australia.*
1900 Watkins, C. J., *King's Mill House, Painswick, Stroud, Gloucestershire.*
1904 Watson, Rev. W. Beresford, *St. Martin's Vicarage, St. Philip, Barbados, W. Indies.*
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1896 Wileman, A. E., c/o H.B.M.'s Consul, *Kobe, Japan.*
1894 Wilson, Edwin, *Mill-lane, Cambridge.*
1904 Winterscale, H., F.Z.S., *Ravanagan, Kedah,* c/o Messrs. Paterson, Simmons and Co., *Penang, Straits Settlement.*
1894 Wolley-Dod, F. H., *Millarville P. O., Alberta, N.W.T., Canada.*
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1881 Wood, The Rev. Theodore, *The Vicarage, Lyford-road, Wandsworth Common,* S.W.
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1899 Woolley, H. S., 7, *Park-row, Greenwich,* S.E. ; and *P. O. Box* 1047, *Waterbury, Conn., U.S.A.*
1891 Wroughton, R. C., Inspector General of Forests, Indian Forest Service, c/o Army and Navy Co-operative Society, Ltd., 105, *Victoria-street,* S.W.

1888 Yerbury, Colonel John W., late R.A., F.Z.S., *Army and Navy Club, Pall Mall,* S.W.
1892 Youdale, William Henry, F.R.M.S., *Daltonleigh, Cockermouth.*
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TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1904.

I. *On the egg-cases and early stages of some* Cassididæ.

By FREDERICK MUIR, F.E.S., and Dr. DAVID SHARP, M.A., F.R.S., etc.

[Read Oct. 7th, 1903.]

PLATES I, II, III, IV, AND V.

THE egg-cases described below have all been discovered by Mr. Muir in S. Africa. In the course of working at the mode of their formation he has also become acquainted with the larvæ, and as these are of a highly remarkable character we have concluded that an illustrated account of them would be acceptable to entomologists, as an addition to our account of the oothecas. One new species is described on p. 13.

Although the eggs of insects are in many instances of a very beautiful and elaborate character, it is only in a few exceptional forms that oothecas or egg-cases are used. The best known examples of these structures are found among Orthoptera, in the Mantidæ and Blattidæ. The German naturalist Verhoeff has recently formed these two families into a separate Order, and has named it Oothecaria.

Until attention was called to these Coleopterous oothecas by exhibition of some of Mr. Muir's specimens at a meeting of the Entomological Society of London it was not known that such structures existed in Cassididæ. In the

most recent work on the family, Weise, in reviewing what is known as the Natural History of the family, says that "the longish eggs are deposited in small clumps fastened to a leaf and surrounded with excrement so that they may not become too dry."

In the case of the African forms here described the eggs are placed in a case that is built of membranes formed of a peculiar substance. In *Cassida muirana* and the forms allied to it the extremely small and imperfect ootheca is covered with excrement, and I think it probable that observation of European Cassidas will show that the excrement is not really placed directly on the eggs, as it is said to be in books, but as in African forms, is placed on an imperfect ootheca. The ootheca is of various degrees of perfection in accordance with the species that forms it; and in the ootheca of *Aspidomorpha puncticosta* the structure is so elaborate and perfect that it surpasses even the comb formed by bees and wasps.

We will describe this ootheca at some length, and subsequently deal with the less perfect structures formed by some other S. African species.

OOTHECA.

1. *Aspidomorpha puncticosta.*

Pl. I, figs. 1—6 and 9.

Fig. 1 gives a very good idea of this ootheca as it appears attached to a fragment of the leaf of *Ipomœa pescapræ* and magnified two times. Fig. 2 gives a horizontal section and fig. 3 a perpendicular one. It is seen from fig. 2 that a large number of cells exist, and the figures show that in four of the rows each of the cells contains an egg. In the ootheca figured there are about 80 eggs. The outer row of cells on each side of the egg-case is different in form from the four rows in the middle and contains no eggs. The structure is formed of nearly two hundred separate and distinct membranes. One of these membranes is shown in fig. 4, and two together in fig. 5. Before attempting to explain the structure in greater detail, it will be well to give the description of the mode in which the Insect proceeds in its formation. The beetle selects a suitable spot, generally on the under-side of a leaf of *I. pescapræ*. Having taken up her position, she plants her anterior feet firmly, and

does not move them during the whole operation. The posterior * pair of legs are held up so as to be out of the way. The abdomen is then extended and the oothecal plates extruded. Placing the tips of the plates against the surface of the leaf she exudes a small quantity of colleterial fluid which adheres to the leaf. Then compressing the oothecal plates together and moving the abdomen upwards † this fluid is drawn out between the plates as a thin membrane. Having attained the limit of the upward movement, the two oothecal plates are moved laterally upon one another, so that the membrane is cut off. It rapidly dries and becomes hard on exposure to the air, and is then tough and elastic. To form a second membrane she brings the tip of the abdomen again to the surface of the leaf, but a little on one side of the point of attachment of the first membrane, again exudes some colleterial fluid, and elevating the abdomen, another membrane is formed. Having thus fastened a few membranes firmly to the leaf, the beetle now begins to add the deposition of eggs to the process.

An egg after passing down the oviduct becomes covered with colleterial fluid. This egg is placed about the middle of the membrane behind it (it is of course one previously deposited: the formation of the ootheca proceeds from behind forwards). The egg adhering in this position, the abdomen is moved downwards (*i. e.* towards the leaf), but when it has reached the limit of movement in this direction it does not touch the leaf, but, moving in a parallel direction with that of the preceding membrane, is turned upwards so that the membrane is doubled, and the movement continuing upwards the end of the membrane is left free at the top, when the limit of upward movement is reached.

A point of considerable interest may now be referred to. It should be recollected that the ootheca is so formed that when the eggs it contains have hatched the young have an easy road for exit left at the top, but cannot escape at the bottom of the ootheca. A similar condition exists as to the egg-case of Mantidæ, and has given rise to much difficulty as to how it is brought about. The two authors of this paper are not in agreement as to the mode in which

* In other divisions of *Chrysomelidæ* the hind-legs play a very important part in the formation of the egg-envelope.

† In this description of the process it is for the sake of clearness supposed that the beetle is working right-side up on the upper-surface of a leaf. Usually, Mr. Muir says, this is not the position.

the closure of the under-surface is effected in the case of *A. puncticosta*, but both are agreed that no special act of intelligence is required to effect it. Mr. Muir thinks that at the moment the abdomen has reached the limit of its downward movement and is just turning upwards another structure comes into play.* "Another plate in the abdomen, similar in form to the lower oothecal plate, comes into play. It is similar in shape to the lower oothecal plate, and passes over the newly-formed membrane, giving the pressure necessary" to make this, while still soft, the requisite shape, and also to make it retain by adhesion this form and the position given to it.

It appears possible, however, that the matter is even simpler than this, and that the closure and consolidation of the floor of the case may be due simply to the delay at the moment of reversing the movement of the abdomen, supplemented by the exudation, then, of a rather larger amount of material, sufficient to fill any gap or irregularity; the position given being maintained by the elasticity and pressure of the parts previously constructed.

With regard to the fact that the case is so constructed as to leave an exit for the larva only above, and none below, we may add that there does not appear to be any advantage in this limitation of modes of egress for the larva. The advantage, if it existed, would consist in limitation of modes of ingress for enemies. But in the case of the exits that do exist, these are amply protected by the long free ends of membranes curling over, while at the bottom it will be recollected there are no free ends; for each membrane forms there a fold. It is the connections of, or between, these folds that close the floor of the case and that have to be accounted for. See Pl. I, fig. 9.

The egg and membrane having been thus deposited, another egg is placed by the side of the first (and of course on the anterior face of the membrane), and the process is repeated. The series of four rows of eggs is attained by means of slight lateral movement of the abdomen, as will be comprehended by the diagrammatic figure (fig. 6, Pl. I.) showing the sequence of the position in which 8 successive eggs are placed. It will be noticed that though

* Mr. Muir considers that this is the 7th ventral plate of the abdomen; plates 7–10 being, he considers, invaginated and used for these mechanical purposes.

only two eggs are placed in a row by the Insect they form actually four series.

The special structures of the female *Asp. punctivosta.** (Pl. I, figs. 7, 8.) The external orifice of the cloacal chamber is transversely elongate, and its lips are surrounded by short hairs, When the lower lip is forced open two oothecal plates can be seen. A pair of colleterial glands, in addition to a spermatheca, the oviduct, and the intestine open into this chamber. The structure considered to be a spermatheca is a chitinous chamber, with a long slender spiral chitinous tube connecting it with the base of the oviduct. It is very different from any spermatheca Mr. Muir has observed in other Insects: but according to Stein † this form is probably specially characteristic of Cassididæ. The two diagrammatic figures, 7 and 8, give an idea of the relations of these parts.

With the aid of this brief description of the actual mode of proceeding, and a similarly brief review of the structures used, it is possible to understand the nature of the ootheca.

The shape of a single membrane is very peculiar (Pl. I, fig. 4); it is narrow where it is attached to the egg, and becomes broader as it gets to its end. The exact shape cannot be perfectly ascertained, as we have failed to isolate them without tearing, after they have been stuck together by the Insect. They are clearly very far from being all alike, but the general shape can be gathered from the diagram fig. 4, which shows one of them isolated, and from fig. 5, which shows two of them together but isolated from their neighbours.

The membranes are soft and pliable when extruded from the oothecal cavity, and rapidly become solid, and thus retain the form they are made to assume during the construction. The cells are made to a large extent by the eggs pushing apart the membranes in some places, and pushing them together in others, but they are partly due to the shape of the membranes, which are, each one, curvate, and moreover are doubled so that sometimes two concave faces are brought together; in other cases the outside edge of a membrane projects somewhat, and thus keeps the

* This account is entirely due to Mr. Muir. The dried specimens at my disposal do not enable me to form any idea as to the rather complex structures involved.—D. S.

† Stein; Geschlechts-Organe bei den weiblichen Käfern, 1847, p. 132, Pl. VII, fig. xvii.

next membrane a little way off. These various facts are seen by examining those cells, at the two ends, that contain no eggs: at these places the cellular structure still exists, though in more irregular fashion than in the area of the egg-containing cells. The outer row of cells on each side is quite different in form and never contains any egg. Though this outer layer (fig. 2, Pl. I) appears to consist of closed cells, it is very easy to convince oneself that the apparent cells are not really such, but are merely due to the curling of the membranes where they have a free projection externally.

A very remarkable feature of the membranes is that at the edges they are often provided with a delicate incrassation or margin. This adds greatly to their strength, and assists their retention of the shape given to each membrane at the moment of its being added to the edifice.

Before considering some points of general interest we will give some brief particulars as to other Cassid oothecas discovered by Mr. Muir in Natal near Durban.

2. *Aspidomorpha tecta.*

This ootheca is much smaller than that of *A. puncticosta;* it contains only from 14 to 20 eggs. It is attached to the leaf of the food-plant—*Ipomœa holosericea* —in a very different manner. One membrane only is attached to the leaf, and by its broad face; this membrane is folded at the bottom and the part that is reflexed upwards is very much curved, so that the rest of the membranes repose in it as if it were a cup. The transverse section of this ootheca is composed of only a single membrane —not of six as in *A. puncticosta*—and there appear to be only seven or eight membranes in the whole structure. The differentiation between the first and last of these membranes is very remarkable. We have no particulars as to the mode of construction, and have seen so few specimens that we cannot set forth its intimate structure.

3. *Aspidomorpha confinis.*

Pl. II, figs. 10, 11.

The ootheca (figs. 10, 11) is small, it is attached to the leaf of the food-plant, *Ipomœa holosericea*; the first membrane has a wide attachment to the leaf, but is destitute

of the remarkable form it possesses in *A. tecta*, differing indeed very little from the other membranes: of these there are only eight or ten used in the formation of the complete ootheca. There are no marginal cells and each membrane extends the whole width of the ootheca. There are spaces for about 14 eggs in a case, and the eggs are rather irregularly placed, so that the cells are also irregular. After the eggs have been laid only about two membranes are laid free on them: as these free membranes can be easily turned back their form can be readily seen. This ootheca on account of its comparative simplicity is a very instructive one.

4. *A. tigrina.*

Pl. II, figs. 12, 13.

The ootheca (figs. 12, 13) is in general similar to that of *A. confinis;* it differs in several unimportant details and in one very interesting point, viz. that the membranes project much at the sides, and thus exhibit a very irregular set of marginal spaces. The membranes appear to be—notwithstanding the considerable width of the ootheca—each not very broad; the width of the case and the considerable projections of the membranes laterally is apparently due simply to the fact that one membrane is laid a good deal to one side of the middle line, another membrane much to the other side, and so on; by this means the case can be made to be in some places nearly twice the width of a single membrane.

5. *Basipta stolida.*

Pl. II, figs. 14, 15, 16.

The ootheca of this species is a remarkable structure totally different in plan (using the word in our interpretative fashion) and mode of execution from those previously described. The ootheca is occasionally attached to the surface of the leaf of the food-plant—*Brachylæna discolor*—but much more frequently it is attached to the stem and built around this, so as to form a very convex body, somewhat like a sphere of which about one-third has been cut away. It is formed of very delicate membranes. The cells, some twenty or thirty in number, are placed so that there is no membrane intervening between the leaf-surface, or twig-surface, and the membranes that form the first

series of cells. After the thirty cells have been formed and the eggs laid, there is then applied a thick chitinous covering* forming a hard shell. Outside this shell numerous delicate membranes are applied so as to form many cells about the circumference. A very peculiar structure is thus produced. It has somewhat the shape of an ant-hill or termitarium.

Not only is the structure itself different in form from the oothecas of the genus *Aspidomorpha*, but even a single membrane shows characteristic distinctions; there is a thickening along the middle of each (fig. 16), like the mid-rib of a leaf, and instead of being curvate in transverse section each membrane is slightly angulate. This is due to the shape of the oothecal plates which Muir describes as "indented with a V-shaped cut, the sides of which hardly meet at the apex" of the V (fig. 17).

6. *Cassida muirana.*

Pl. II, figs. 18, 19.

The ootheca of this species is a very small structure consisting of about four cells. It is laid flatly on a leaf and covered with a layer of excrement, from under which the membranes project a little on each side.

7. *Cassida unimacula.*

This species is fairly common at Durban, but we can give very little information as to the ootheca. A specimen of it laid two eggs in a folded membrane in Mr. Muir's breeding cage. So that it is probable the ootheca will prove to be a very small structure as in the case of *Cassida muirana*. Both of the eggs were subsequently found to be parasitized.

8. *Laccoptera excavata.*

The ootheca is small and usually contains only two eggs, but sometimes four. It is attached to the surface of a leaf of *Ipomœa holosericea* by a membrane. One or two membranes destitute of eggs are placed on the exposed surface, and then the whole is covered with a layer of excrement

* Mr. Muir thinks this is due to a number of membranes plastered firmly together. It may, however, be due to a quantity of colleterial matter applied in some other special manner.

so as to entirely conceal it. This small structure is therefore like those of the genus *Cassida*, though the insect, having pectinated claws, is considered to be allied to *Aspidomorpha*.

METAMORPHOSES.

Much attention has been attracted to the extraordinary nature and habits of *Cassididæ* larvæ, and yet information on the subject is extremely limited. The observations here given add therefore considerably to our knowledge. The following brief descriptions are supplemented by the figures on Plates III—V.

1. *Aspidomorpha puncticosta*.

Pl. III, figs. 20*a*—20*f*.

The larva is about 7 mm. long when hatched out and undergoes four moults at intervals of four or five days with very slight alteration except in size; at the fifth moult it becomes a pupa, and remains in that condition for a week or ten days before the imago comes forth.

The pronotum is well developed, and the head can be entirely retracted beneath it. It has four pairs of fleshy spikes, two pointing cephalad and two laterad. The meso- and metathorax are both well developed and each bear two pairs of lateral spikes similar to those on the prothorax.

The abdomen consists of ten visible segments. The first nine each bear a pair of spikes similar to those of the thorax. The eighth pair is slightly more ventrad than the others, and the ninth pair greatly enlarged and much more dorsad. When the larva is first hatched out the ninth abdominal spikes are 15 mm. long, nearly twice the length of the larva. These long spikes are carried over the back by the last two segments being turned upwards. When annoyed or alarmed several sharp flicks are given with them.

At each ecdysis the old skin is not cast entirely away, but is retained on the ninth abdominal spikes and carried over the back, thus a full-grown larva will have four old skins of varying sizes to carry over its back and flick about when annoyed.

The tenth segment bears a pair of small beadlike protuberances, homologous to the spikes on the other segments,

which can be seen by turning the ninth spikes over the back.

The first thoracic and first eight abdominal segments bear a pair of spiracles each which are white and raised up above the body surface. They are situated above the fleshy spikes.

The larva is of a whitish colour and bears two large dark chitinous plates on its pronotum. The following segments have two dark marks on each side, and the abdominal segments a dark dorsal mark. These marks vary in size and often coalesce laterally, and the colour varies from light grey to black, against which the white spiracles show up distinctly.

Pupa. In the pupa the pronotum is greatly enlarged and extends beyond the head. The thorax has lost all trace of spikes. The first five abdominal spikes become spatulate and curved, and the outer surface covered with glandular hairs which secrete an oily substance. The other four pairs of spikes become greatly reduced in size, the ninth pair becoming short, thick and curved at the tips, to which the five larval skins still adhere and hang over the back.

The tenth urite is evidently withdrawn into the body.

2. *Aspidomorpha tecta.*

Pl. IV, figs. 21*a*, 21*b*.

The larva of this species when first hatched is yellowish and flattish. It bears the same number of spikes as *A. puncticosta*, and the ninth abdominal pair is greatly enlarged and retains the cast skin at each ecdysis.

The tenth abdominal segment is capable of being extended and then forms a tube down which the excrement is slowly passed and hardens upon exposure to the air, and forms long slender filaments. During the first two instars the filaments are attached to the ninth abdominal spikes, in a radiating manner. During the following instars the filamentous excrement is dropped, the tenth abdominal segment being too short to reach to the base of the ninth abdominal spikes.

The pupa is delicate semi-transparent green or yellow. The pronotum is greatly expanded and has a series of little spikes all round its edge, two pairs being larger than the others. The mesa- and metanotum are well developed but bear no spikes. The number of visible abdominal

segments is the same as in *A. puncticosta*. The first five abdominal spikes are expanded horizontally into transparent lanceolate membranes beset around by spikelets. The remaining four are greatly reduced, but the ninth still carry the larval skins.

Food-plant—*Ipomœa holosericea*.

This larva differs from those of *A. tecta* and *A. tigrina* by the fact that it retains in later life only the excrementitious filaments of the earlier stadia, there being apparently an anatomical difference in structure that renders this species incapable of the feat that makes some of its congeners so remarkable.

3. *Aspidomorpha confinis*.

Pl. IV, fig. 22*a*, 22*b*.

The larva of this species is flattish, and of the same shade of green as the upper surface of the leaf of its food-plant (*Ipomœa holosericea*). It bears the same number of spikes as its allies, and the old larval skins are retained on its ninth abdominal spikes. The skins are delicate and dry up and are carried out straight behind, and in no way hide the insect as in other species. It generally feeds upon the upper-surface of the leaves and may possibly find sufficient protection in its colour.

The pupa is green, and the first five abdominal spikes flattish, and, except in colour, differs little from *A. tecta*.

It is to be noticed that this species retains the old skins in a manner similar to its congeners, but that the partial inability of *A. tecta* to make use of excrementitious filaments is in *A. confinis* complete.

4. *Aspidomorpha tigrina*.

Pl. IV, figs. 23*a*—23*d*.

The larva of this species feeds generally on the underside of the leaf. In colour it varies from a light yellow to green. It is surrounded with spikes similarly to *A. puncticosta*, and the ninth abdominal spikes are enlarged.

The tenth abdominal segment is very mobile and retractile, and the excrement passes out in long slender filaments and hardens on exposure to the air. When the filament has reached a certain length the tenth segment is curved upwards and the filament fixed to the base of the ninth abdominal spikes.

At each ecdysis the old skin is retained on the ninth abdominal spike and also the filaments attached to it.

The long black filaments shown in figures 23*a*, *b*, *c*, *d*, are the excrement of the creature. They are, of course, not present when the larva is first hatched out; but all the filaments that are subsequently produced are retained till the imago emerges; the crop of them produced during each stadium remaining attached to the old larval skin. We do not know how these filamentous excrements are produced, and there appears to be no authentic information on the subject in literature.

The pupa varies from yellow to green in colour. The spikes round the pronotum and abdomen are slightly bordered with black, and a dark mark runs down each side of the back. The pronotum is expanded into a semi-transparent shield surrounded with fine spikelets, two pairs of which are ofttimes larger than the rest. The pro- and metanotum lose all traces of spikes.

The first five abdominal spikes become flattened into thin transparent lancoelate membranes surrounded with small spikes. The remaining four pair of spikes are greatly reduced in size, and the ninth pair hold the cast larval skins and attached, intestinally-made filaments.

The use of excrementitious filaments reaches its maximum * in *A. tigrina*, and the larva with its array of bristles and its complex series of excrementitious appendages is a truly wonderful object.

5. *Basipta stolida*.

Pl. V, figs. 24*a*—24*d*.

The adult larva of this species is whitish, the thorax being marked with brown and a dark mark runs down each side of the back. When first hatched out it is nearly all black.

The spikes surrounding the larva are numerically the same as in *A. puncticosta* but are proportionally smaller and not so beset with bristles. The ninth abdominal spikes are greatly enlarged, thick, strong and curved at the tips; they are a dark colour below and light above, so

* That is to say, so far as the species we are here dealing with are concerned. The Brazilian *Porphyraspis tristis* far surpasses *A. tigrina*, but uses the wonderful filaments it produces in a totally different manner.

that when carried over the back the colour harmonizes with the black. Generally they are carried out straight behind, and when the insect is annoyed it sharply flicks them over its back and head.

The ecdysis of this species is complete and the old skin is not retained on the ninth abdominal spikes; neither is the excrement retained.

In the pupa the pronotum is greatly enlarged and the thoracic spikes disappear. The first five abdominal spikes become thicker and flatter. The remaining spikes are greatly reduced in size and even the ninth pair are quite small. The last larval skin is retained on the end of the abdomen, and with the chitinous skin of the ninth abdominal spikes lies over the back.

This form is highly exceptional in the larval state. The great development of the robust anal callipers (fig. 24), though these are not used for the purposes they are put to in *Aspidomorpha* and in *Cassida*, is extremely peculiar. It should be noticed that these callipers are comparatively as largely developed in the young larva (fig. 24*a*) as in the adult. Their robustness in the newly-hatched form is a striking character of this species. In the pupa the last larval skin is retained at the base of the callipers, not upon them. Both the callipers and these appurtenances drop off before the imago emerges. This larva is a quite isolated form amongst the Cassidid larvæ at present known, and a careful study of it would be of great interest.

6. *Cassida muirana*, n. sp.

Pl. V, fig. 25*c*.

Parva, parum convexa, haud nitida, pallide testacea; antennis articulis ultimis quatuor nigris; elytris late nigricantibus fortiter punctatis.

Long 4 mm. Lat. $3\frac{1}{4}$–$3\frac{1}{2}$ mm.

Thorax with very little punctuation, the punctures appearing merely as very minute spots of a brownish colour, the lateral angles distinct and not rounded though very obtuse, the scutellar lobe broadly truncate. Elytra short and broad, humeral angles extending only very slightly more outwards than the angles of the thorax; the punctuation coarse, deep and irregular though quite distinctly serial; the colour pallid, but very extensively marked with black in a somewhat variable manner; the summit, always pallid; the dark colour in front extends forwards and outwards to the margin, but leaves a

minute spot at the humeral angle pale; behind the middle the dark colour extends outwards again to the margin, leaving a large pallid spot at the side between itself and the anterior outward extension; near the summit of this spot the surface is rather deeply depressed. The black colour may be so much extended as to nearly obliterate the lateral pallid mark. There is trace of hairs on the surface, which is rough and not shining. The under-surface is vaguely variegate with black; the colour of the epipleural dilatation being the same as on the upper-surface.

I am indebted to Herr Julius Weise for the information that this species is undescribed and allied to *C. innotata*, Boh. It lives at Durban on a species of *Solanum*, but has only once been met with.—D. S.

I have only taken one batch of this species, and the larva and pupa (figs. 25*a*, 25*b*, Pl. V.) are similar to *Cassida unimacula*, being hidden under a shield of excrement.—F. M.

7. *Cassida unimacula*.

Pl. V, figs. 23*a*, 26*c*.

This larva is flattish and dark in colour, with the spikes and edge of the body of a lighter colour. The larva is surrounded with spikes as in *A. punctieosta*, but the spikes are flattish and edged with spikelets. The ninth abdominal spikes are larger than the others, and shortly after hatching become covered with excrement. At each ecdysis the old skin is retained on the ninth abdominal spikes, and is soon covered over with excrement and forms a triangular shield, which is carried over its back and completely covers the larva. I have often mistaken this larva for the excrement of snails, which are very plentiful on its food-plant (*Brachylæna discolor*).

Pupa. The pronotum is greatly enlarged in the pupa, and its edge is surrounded with little spikes, two pairs of which are larger than the rest. All traces of spikes on the meso- and metanotum are lost, and the first five abdominal spikes become thin flat spade-shape membranes, edged with spikelets.

The system of using the excrement is in this species the same as it is in the European congeners, and is totally different from that adopted by the species of *Aspidomorpha*;

the mode in which it is attached is similar in the two genera. The excrement in *Cassida* accumulates in a solid mass, which is held flat on the back of the larva. In fig. 26*a*, Pl. V, the excrementitious shield is shown folded backwards, so as to allow the shape of the larva to be seen.

8. *Laccoptera excavata.*

This larva is very dark, in some instances quite black. The spikes surrounding it are proportionally small compared with *A. punctivosta*. The ninth abdominal spikes are larger than the others. Shortly after hatching, these ninth abdominal spikes are covered with excrement, and before the larva is two days old a "shield" is formed, under which the larva can hide itself. At each ecdysis the old skin is worked into the shield and covered with excrement.

These larvæ expose themselves quite freely upon the upper-surface of their food-plant (*Ipomœa holosericea*), and unless one is acquainted with their habits, he would never think the black blotches were living creatures.

The pupa is of a golden colour, marked with black. The pronotum is enlarged and edged with spikelets, a pair of which is larger than the rest. The first five abdominal spikes are flattened into thin membranes edged with spikelets. The other spikes are greatly reduced in size.

In the larval structure and habits this insect is a *Cassida*—not an *Aspidomorpha*—form; and we have already pointed out that its ootheca is also that of *Cassida*.

ETHOLOGY.

In considering some points of general interest in connection with these oothecas and with the larval habits, it is desirable to make a few general remarks as to the information that has been put on record by other Naturalists. And in order to do this satisfactorily it will be well to treat the oothecas and larvæ separately.

A. Oothecas.

The eggs of insects are usually provided with two coverings, a very delicate internal one called the vitelline

membrane, and a stronger external one called the chorion. In the great family *Chrysomelidæ*—to which the *Cassididæ* belong or are allied—there is usually an additional envelope, which is very various according to the divisions of the family. This envelope has been discussed in an excellent manner by Lécaillon,* who calls it an epichorion. The epichorion, in the divisions of the family in which it is already known, is applied to each egg separately, and thus differs from what we have described in *Cassididæ*, where a capsule or common envelope is formed for a number of eggs varying according to the species. Nevertheless it is probable that the ootheca is essentially similar to the epichorion of the other forms of the family, and we hope to show that it is really a substance applied to each egg; the capsule, however complex, resulting merely from the mode of application and the abundance of the material used.

We have nothing to add to the excellent *résumé* of the epichorion given by Lécaillon in his memoir; and will merely remark that of the forms of epichorion distinguished by him, it will probably prove that the material used by *Chrysomela menthastri* is the most similar in general respects to that of these *Cassididæ*: and also that by *C. menthastri* the epichorion is applied in such a manner as to connect the eggs together. We have made no observations on the histology and chemistry of the membranes of *Cassididæ*, and it is therefore doubtful whether the similarities in *Chrysomela* and *Cassididæ* will prove to be of importance. A few further remarks on this point occur at the end of this paper. The structure and mode of formation of the ootheca in *Mantidæ* has been quite recently discussed in a valuable paper by Giardina.† The *Mantidæ* are so totally different from *Cassididæ*, that one would expect to find great differences in the corresponding oothecas. One very striking physical distinction exists between the two, inasmuch as the ootheca in *Mantidæ* is formed by layers of foam,‡ while in *Cassididæ* it is constructed of membranes having no trace of a foam-like structure. On the other hand, the general resemblance between the egg-case of *Mantis religiosa* as described by Giardina and that we have investigated in *Aspidomorpha puncticosta* is surprisingly great; and we gather from Giardina's memoir that

* Arch. anat. micr. II, 1898, pp. 89–117, Pl. V.

† Giorn. Soc. Palermo, XXII, 1899, pp. 286–326, Plates I and II.

‡ No! See Postscript on p. 21.

the Mantid ootheca is formed of layers of matter, doubled, as in the case of the membranes of *Aspidomorpha;* * soft when emitted, and hardening on exposure to the atmosphere, as is also the case with the membranes of *Aspidomorpha* and with the simpler epichorion of *Chrysomela menthastri.*

Giardina's memoir gives a much better account than any that has previously been given; and the parallelism between the biological facts in *Mantidæ* and in *Cassididæ* is a point of considerable interest.

Taxonomy of the oothecas here dealt with.

The oothecas of the S. African *Cassididæ* noticed in the preceding pages fall into three very natural divisions.

1. A covering of excrementitious matter is added to the very small and imperfect ootheca which consists of only three or four cells. *Cassida, Laccoptera.*
2. There is no coat of excrementitious matter.
   - *a.* The ootheca is attached, at one extremity, to a leaf by one, or a few special egg-less membranes; and has a bilateral symmetry. *Aspidomorpha.*
   - *b.* The ootheca is attached by a broad base to a leaf or round a stem, by means of the egg-membranes; has a concentric symmetry, and consists of three differentiated strata, viz. (*a*) The eggs and their attached membranes, (*b*) a stratum of agglutinated membranes forming a shell, (*c*) a circumferential layer of two or more series of large empty cells. *Basipta.*

In the genus *Aspidomorpha* the ootheca of each species examined has special characters by which it can be recognized.

There can be no question that the modes in which the eggs of insects are deposited have a considerable bearing on the numbers of individuals that are hatched. The place where these oothecas have been discovered and investigated by Muir is a large area of sand on the seashore near Durban, covered by creeping plants and low vegetation. It is on a large-leafed convolvulus—*Ipomœa pescapræ*—on these sand-hills that *A. punctivosta*, the species with the most perfected ootheca, feeds and forms its egg-case. Eggs deposited on the leaf without any

* I believe that in Mantidæ there are two kinds of colleterial glands.—D. S.

covering would doubtless suffer greatly from drought, or downpours, or great changes of temperature. We may feel sure therefore that the ootheca of this insect, surrounding as it does the eggs with a complete periphery of large air-cells, is very valuable, and it may aid the survival of the young, even if the structure should be covered with sand.

The ootheca does not offer protection from parasites. Mr. Muir has found that the eggs of *A. puncticosta* are very extensively parasitized. In the case of one species of Chalcid he has observed the oviposition; the little parasite sits on the back of the beetle and flies down and oviposits in an egg whenever it feels inclined. The construction of an ootheca containing about 80 eggs occupies about 20 minutes, so that this parasite has plenty of time for its operations, and the Cassid would clearly be more efficiently protected against its attacks if the ootheca were dispensed with and the eggs deposited rapidly and covered with a coat of membranes similar to the shell layer of the *Basipta* ootheca. The Chalcid parasites that emerge from these Cassid oothecas are very numerous, Mr. Muir having already discovered several species. They do not, however, seriously affect the perpetuation of the species, as Mr. Muir considers *A. puncticosta* to be a common insect from Durban to Zanzibar; and it probably extends farther, as he thinks he has seen it at Aden.

The variety of the oothecas in these seven or eight species of *Cassididæ* is very remarkable. The contrast between the small irregular structure of *Cassida unimacula* and the large and complex edifice produced by *A. puncticosta* is very striking.

Although the *puncticosta* ootheca is a really admirable production, there is no reason to suppose that any skill is exhibited in its production. The operation seems to be more comparable with the actions of a machine. The factors that contribute to its superiority (if we may use such a term) are of the simplest character: viz. the large size of the insect, the order in which the eggs are deposited, and their large number, the completely stationary position of the insect, the great width of the orifice of the abdomen from which the colleterial fluid is exuded, and, above all, the remarkable qualities and great abundance of the colleterial fluid. It is from the combination of these characters that the perfection of the structure results. The

operation of case-making is performed by the Insect without its seeing what it is doing, the case being constructed between the lower surface of the abdomen and the surface of the leaf. We can scarcely suppose that the cerebral ganglia are concerned; and some dissections made by Mr. Muir have not revealed any peculiar structure of, or even development of, the terminal ganglia.

These conclusions agree with those of Giardina. He found that a Mantis that has had its head eaten away can still construct an ootheca. Giardina's account of this (l. c., p. 313) leaves some doubt as to the extent of the destruction of the head in the case he describes.

The substance used in the construction of the cases has most remarkable properties, and it is to these that the possibility of construction of the case is due. We have already mentioned that we consider these cases may prove to be homologous with the epichorion found as envelopes to the solitary eggs of other divisions of *Chrysomelidæ*. But in another Order of Insects we find parallel cases. The remarkable stalked eggs of the Neuropterous genus *Chrysopa* are well known to naturalists, and Dr. Jenkinson has reminded one of us that the formation of the pedicel is in this case due to a material that has properties similar to that used by the *Cassididæ*, and that is used in a somewhat similar manner. The way in which these stalked eggs are formed has previously been described;* we may here recall that the *Chrysopa* touches a leaf or other substance with the tip of the abdomen, and then drawing the abdomen away leaves an erect thread of substance adhering at one of the extremities to the leaf and at the other extremity to the egg which is held in the abdominal orifice, only partly extruded, for a few seconds; by which time the thread has become hard, and, when the abdomen is withdrawn, the egg is found to be placed at the head of this thread-like pedicel.

B. The Clothing of the Larvæ.

The variety in this matter is also very interesting. Particulars have been given in the preceding pages under the headings of the eight species. We may here confine ourselves to a comparison.

Taxonomy of the larval clothing. Our eight species fall into three very definite groups:

* By Müller, Ent. Mo. Mag., ix, 1872, p. 60.

1. The larva is naked . . . . . *Basipta.*
2. The larva carries the old skins.
   (*a*) The excrement is attached to the old skins, and forms a solid pad. . . . . *Cassida*, *Laccoptera.*
   (*b*) The excrement does not form a solid pad, but is carried either in the form of long filaments or is not used at all. . . . . *Aspidomorpha.*

The four species of *Aspidomorpha* fall into three divisions, viz.:

1. The larva carries long filaments of excrement attached to each one of the old skins it bears. . . . . *A. tigrina.*
2. The larva carries long filaments attached only to the earliest of the old skins. . . . . *A. tecta.*
3. There are no filaments of excrement. *A. punctivosta* and *confinis.*

We are not yet able to explain these variations, as comparative observations on the formation of the filaments and on the structures by which they are formed are wanting, except for the brief remark made on a previous page as to a difference in the length of the anal tubes of two species of *Aspidomorpha.*

Comparative observations on the movements and actions of these different kinds of larvæ are also wanting, so that it is too early to consider the uses to which their peculiar clothing and armature are put. Two opinions on this subject have already been expressed. Candèze considers that the apparatus protects the larvæ against enemies, while Weise denies this, and says the larva *Cassida* is protected by its clothing against drought.

Mr. Muir's observations on *A. punctivosta* show that the larva is "very heavily parasitized." He has bred a species of the genus *Chalcis*, as well as other *Chalcididæ* from it. Broods produced at certain seasons are more affected by the parasites than those produced at other seasons; a phenomenon that is well known in parasitology. In the case of *Cassida* and *Laccoptera*—the pad-bearing forms—the larvæ feed on the upper surface of the leaf, and thus afford some slight grounds for the "protection against drought" theory.

As we have already previously said, we have made no observations as to the composition or chemical characters of what we have called the colleterial fluid. It is probably not true chitin, though it possesses the property of drying

and hardening rapidly when exposed to the air. The rapidity with which it becomes hard is remarkable, and is more marked than it is in the case of chitin. Lécaillon, whose paper on the envelopes of the eggs of *Chrysomelidæ*, in Arch. Anat. micr. II, 1898, has already been referred to, tells us that, in conformity with the views of Tichomiroff, he considers the chorion of eggs to be formed of a peculiar substance—chorionine—very different from chitin. In *Chrysomelidæ* he distinguishes two forms of epichorion—(1) excrementitial coverings, e. g. *Clythra*, *Cryptocephalus*, (2) epichorions composed of special secretions. These secretions he thinks to be of two kinds: (*a*) derived from the epithelium of the genital ducts and passages; (*b*) from special glands. In *Cassididæ* both excrementitial and glandular coverings are applied to the eggs, and the glandular part of the epichorion comes from a special gland. Nothing appears to be known as to the chemical properties of these very remarkable glandular epichorions. It is possible that they may prove to be some special kind of chitin.

Postscript.—According to a paper communicated to the Society by Captain Williams and published by the Society in this Part of the Transactions, the egg-case in *Mantidæ* is composed of two substances of dissimilar nature. The material of which the central part of the ootheca is formed appears to be like that used by *Aspidomorpha*. The foam that is concomitantly used by the *Mantis* is constantly brushed away from the middle to the sides, and finally forms an outer covering to the egg-case. Cf. Williams, p. 130, postea.

Explanation of Plates I—V.

Plate I.

Fig. 1. Ootheca of *Aspidomorpha puncticosta* attached to a leaf of *Ipomœa pescapræ;* seen laterally. × 2.

2. Horizontal section of same. × 3. In one of the series of chambers eggs, in section, are seen.

3. Perpendicular longitudinal section of same. × 3.

4. One of the membranes of which the ootheca is composed, separated with its attachment to the egg. × 4.

5. Two such membranes showing relative positions and mode of connection. × 4.
6. Numbered diagram to show the order in which the eggs are arranged by the insect when constructing the case.
7. Diagram of a longitudinal perpendicular section of the abdomen, showing the parts concerned in the formation of the ootheca; 1*a* to 10*a* dorsal plates of abdomen, 10*a* being the upper oothecal plate; 1*b* to 10*b* ventral plates of the abdomen, 9*b* the lower oothecal plate; *c*, colleterial (or accessory) gland; *i*, intestine; *o*, oviduct; *s*, spermatheca with twisted duct.
8. Diagram of structures opening into the oothecal division of the cloaca; *a*, line pointing to exit of intestine; *b*, line pointing to exit of oviduct; *c*, *c*, colleterial glands (of one group, only the ducts are left); *i*, intestine; *o*, ovaries (tubes cut away); *s*, spermatheca.
9. Ootheca of *Aspidomorpha puncticosta*; diagram to show mode of closure of case below; *a*, *b*, line of junction of bottom of case: the parts above this line are supposed to be seen in section (like Fig. 3), the parts below the line show mode of arrangement of lower surface of the egg-case and are in a plane at right angles with that above the line *a*, *b*; *c*, point of fold of a sectionized membrane; *d*, exposed part of a fold; *e*, egg.

Plate II.

10. Ootheca of *Aspidomorpha confinis*.
11. Transverse section of same.
12. Ootheca of *Aspidomorpha tigrina*.
13. Transverse section of same; one or two of the outer membranes lifted.
14. Ootheca of *Basipta stolida* on a twig.
15. Transverse section of same; *h*, hole of twig. [In this figure the layer separating the two kinds of cells is not satisfactorily shown.]
16. A single membrane of same.
17. Oothecal plates of the female *Basipta*; *a*, lower plate; *b*, upper plate.
18. Ootheca of *Cassida muirana*, with covering of excrement; *a*, membranous margin, not covered with excrement; *b*, excrement.
19. Transverse section of same; *a* and *b*, as in fig. 18.

Plate III.

Illustrating the metamorphosis of *Aspidomorpha puncticosta*.

Fig. 20. *a*, newly-hatched larva ; *b*, second instar ; *c*, adult larva ; *d*, pupa, dorsal view ; *e*, pupa, ventral view ; *f*, imago.

Plate IV.

21. *Aspidomorpha tecta* : 21*a*, larva, with caudal appendage reflexed over dorsum, showing the series of the retained cast skins, only one of which bears excrementitial filaments ; 21*b*, imago.
22. *Aspidomorpha confinis* : 22*a*, adult larva, with caudal appendages extended, showing series of the retained cast skins, none of which bear excrementitial filaments ; 22*b*, imago.
23. *Aspidomorpha tigrina* : 23*a*, 3rd instar, with caudal appendage extended ; 23*b*, adult larva, dorsal view, showing the series of cast skins, four of which bear excrementitial filaments ; 23*c*, profile of adult larva ; 23*d*, pupa, dorsal view ; 23*e*, imago.

N.B.—The lines showing the length of these figures are of little use, as they have been taken from shrivelled specimens.

Plate V.

24. *Basipta stolida* : 24*a*, 1st instar ; 24*b*, adult larva ; 24*c* pupa ; 24*d*, imago.
25. *Cassida muirana* : 25*a*, larva, with caudal appendage bent back ; 25*b*, pupa ; 25*c*, imago.
26. *Cassida unimacula* : 26*a*, adult larva, with caudal appendage bent back ; 26*b*, pupa, with caudal appendage in natural position on dorsum ; 26*c*, imago.
27. *Laccoptera excavata* : 27*a*, larva, 3rd instar, with caudal appendage turned off back ; 27*b*, pupa, with caudal appendage in natural position ; 27*c*, imago.

II. *Illustrations of the male terminal segments and armatures in thirty-five species of the Hymenopterous genus* Colletes. By the Rev. Francis D. Morice, M.A., F.E.S.

[Read December 3rd, 1903.]

Plates VI, VII, VIII, and IX.

It has long been known that the "armures copulatrices" of Colletes ♂♂ yield remarkable specific characters. Mr. Saunders's Synopsis (Trans. Ent. Soc., 1882) figured them for the six British species then known, and in 1891 (Hor. Soc. Ent. Ross., xxv) Radoszkowski published a "Révision," with two Plates, representing in all about twenty palæarctic species.

It is so hard to find really satisfactory specific characters in this genus, that Radoszkowski's work might have been extremely useful if its execution had been somewhat more careful. But even the best of his figures are far too slight and diagrammatic to give an adequate idea of the very complicated objects which they represent. Certain features of these—not always the most characteristic—are emphasized and even exaggerated in his figures, but so many others are ignored that the total impression conveyed to us is often quite unlike that made by the objects themselves. (The manner in which he deals with the *bases of the sagittæ* in these figures is particularly unsatisfactory—the two or three hard lines on a flat field which are meant to suggest their shape being never adequate for that purpose, and sometimes really unintelligible.) Occasionally some attempt is made in the text to explain the characters which the author meant to indicate in his figures, but these explanations often by no means suffice to clear up doubts and difficulties produced by the lack of suggestiveness in the figures themselves. And it must be said further that the "new species" brought forward in this Revision are very poorly characterized, and that his identifications are often questionable, and sometimes certainly wrong.

I am as convinced as Radoszkowski himself can have

been, that Colletes ♂ armatures have usually characters of their own, by which the species can be certainly, and sometimes easily, recognized. But these characters do not depend simply on the outlines assumed by certain portions of the structure in certain positions. Those outlines are often only the somewhat illusory and variable *horizons* of solid objects viewed accidentally in this or that aspect, they depend partly on the focussing adopted, partly on the position of the armature as a whole, and partly on that of each different part of it in relation to the others. This last may depend on a variety of accidents, since the parts are not all equally rigid, so that one or more of them may easily be somewhat distorted or displaced by causes which leave the rest of the structure unaffected. I do not think that Radoszkowski sufficiently realized this fact, which in itself seems to render his diagrammatic way of treating the subject inapplicable. Besides this—or perhaps because of it—he seems too ready to content himself with noting certain arbitrarily selected details, which are often not sufficiently distinctive to bear the weight he lays upon them. Other parts of the structures he dismisses—one might almost say, impatiently, giving the impression that he had studied them not at all or only in certain species. Thus he says that the *volsellæ* "ne présentent aucune particularité," which is quite curiously untrue in this genus, though no doubt their position renders it difficult to make much use of the characters exhibited in them. And in speaking of the *couvercle génital*, as he calls it, he *defines* it in the introductory part of his paper as composed of "two pieces, the *sixth*" (!) "and *eighth* segments"; but he *figures* it both there and afterwards (in the only two cases where he figures it at all) as consisting not of these two segments, nor of either of them, but simply of the *seventh* ventral-plate! This is the more curious, because in his earlier paper on the *Mutillides* (1885) he says quite correctly, that the *couvercle génital* has been shown by Mr. E. Saunders to consist of the seventh and eighth ventral plates; and he figures accordingly, as such, those two plates (clinging together as they often do) both there, and also in a paper published a year later (Hor. Soc. Ent. Ross., xx, 1886). It would seem, then, that between 1886 and 1891—the date of the "Révision"—he must have somehow lost interest in the *couvercle*, or he would hardly have blundered about its composition as stated above. He adds one further

remark in the Revision, and one only, on the *couvercle génital:* viz. that its "form appears to be stable." That, if he means what I suppose him to mean by it, is doubtless true: but it certainly cannot be said to exhaust the subject, nor to indicate that the author had studied it carefully throughout the genus he was revising.

Perhaps the best thing in Radoszkowski's "Révision" is his recognition of a distinct group of species in which the stipites of the armature are simple, *i. e.* not divided by a deep sulcation into two apparently distinct portions—an apical and a basal. This is an easy character to see, and I think it is an important one, though I do not believe that all the other species—those with "divided stipites"—should also be regarded as forming a single group. The species with simple stipites are certainly, to some extent, united by other characters also; and I believe that they are confined to the warmer parts of the palæarctic region. None of them occur in Great Britain, nor, apparently, in Scandinavia. On the other hand, species with divided stipites are found throughout the whole region, and among them are some which seem to have hardly anything else in common (e. g. *cunicularius* and *fodiens*). Still, if it be necessary to classify Colletes-armatures *dichotomically,* this is perhaps the best "fundamentum divisionis" with which to start. And, as far as I know, Radoszkowski was the first to point it out.

But to return to the subject of the above-mentioned "seventh ventral plate"; it was, I think, particularly unfortunate that Radoszkowski, when dealing with *Colletes,* should have dismissed it with such slight and inaccurate treatment, instead of figuring it—or at least describing its form—in each of the species with which he dealt. For, in fact, this segment is generally at least as characteristic for specific purposes as the "armure" itself, and its characters are (for reasons presently to be given) easier both to recognize, to figure, and to describe. One chief object of this paper is to call attention to the very distinctive forms assumed by this segment in different species, and I figure it accordingly, together with the armature, in such palæarctic species as I possess—thirty-five in all—and likewise in an American species, which I cannot name, but which differs evidently from any of them, communicated to me from Massachusetts by Prof. C. T. Bruce of New York. (See Pl. IX, 57, 58.)

Though I am far from feeling competent to attempt a complete monograph of palæarctic Colletes-spp., I hope I may render some service to the future monographist by publishing along with these figures some notes on the insects examined, and a synoptic table of such further distinguishing characters as I have been able to find in their external structure. There does not, I believe, exist as yet any work which deals with nearly as many species as now lie before me. My materials have been partly collected by myself in England, France, Germany, the Alps, and nearly all countries round the Mediterranean, including Algeria, Egypt, and Syria; partly received from various friends and correspondents, especially Professor Perez, Dr. Schmiedeknecht, and Messrs. Friese, Kohl, Alfken, Vachal, and Edward Saunders. To Professor Perez above all—with whom I have been throughout in constant communication, and who has supplied me most liberally with material, including many of his own new species—any value that my work may have will be chiefly due.

With regard to one of the great difficulties connected with this genus, the obscure and entangled state of its "synonymy," I must say at once that I can do almost nothing to remove it. The original descriptions of their species by early authors are nearly always quite insufficient to fix their identity for certain, and I have had no opportunity for examining any "types" of them that may still exist. In calling species, therefore, by the old and familiar names of *succinctus*, L., *ligatus*, Er., etc., I express no opinion of my own as to the correctness of these identifications, but merely accept what I take to be the view generally current among hymenopterists. Even when I have reason to doubt this view, though I shall say so, I shall not always discard the name that is commonly adopted. Such insects as are unknown to any of my correspondents I shall treat as "new species," even if I know some old vague description to which they might possibly be referred. I think that, as matters stand at present, less confusion will be created by employing a name that may ultimately have to sink as a synonym, than to fix an old name on to a species to which it does not really belong. What I aim at is to ascertain, as far as I can, how many real species lie before me, and how they may be distinguished from one another. How they are ultimately to be called in our lists is another question, which must be

settled by the future monographist of the genus, and to him I leave it. Still I *do* occasionally mention points which seem to me deserving to be considered when that question comes up for definite settlement.

Let us now consider in a general way (*a*) the concealed abdominal plates in Colletes ♂ ♂, and (*b*) the armature proper.

The concealed abdominal plates.—Of these some are dorsal, some ventral. They all lie, normally, enclosed within the apex of the abdomen and immediately adjacent to the "armature." To this, I believe, they both act as a protective sheath, and also in some way co-operate with it in its special functions (clasping, etc.). For these purposes they are always extraordinarily modified from what we must suppose to have been their original form, viz. that of semi-annuli. And it may be noticed here, that at least on the ventral side this sort of modification commences in a rudimentary way even in the preceding (unconcealed) segments. The sixth, especially, when mounted in balsam and rendered semi-transparent, is seen to be far from uniform in its structure and chitinization, and is often tuberculated and foveated in a manner which probably bears some relation to the forms of the organs underlying it. (Cf. Pl. IX, figs. 49, 50, 52, 53.)

From between the armature and the seventh *dorsal* plate may be extracted (though seldom unbroken) the object which I figure in Pl. IX, 40. This, following Dr. E. Zander, I take to consist of a pair of dorsal plates—the eighth and ninth of the abdomen reckoning from the constriction, *i. e.* exclusive of the propodeum. I have not found any specific characters in them; and they are so extremely fragile and difficult to study, that I confine myself to figuring a single successful extraction of them.

The concealed *ventral* plates are the seventh and eighth of the abdomen (exclusive of the ventral plate, if such exists, which answers to the propodeum—I have never succeeded in finding any trace of one !).

The eighth plate seems very similar in all species. (See Pl. IX, 44.) It has none of the paradoxical variations of form which make this segment so characteristic in some species of Prosopis, Andrena, etc.

The seventh ventral plate, however, is a most interesting and surprising object. Its base is a ribbon-like strip or arch of chitin, joined at each end to the corresponding

dorsal plate. Springing from the apex of this arch appear nearly always two large symmetrical lobes or "wings." They are perfectly colourless and membranous at the extreme apex, still membranous, but more or less infuscated, punctured, and pilose on the disc, evidently chitinized at the base and along the inner margin, and at least somewhat thickened and darkened on the exterior margin. Each of them consequently has the appearance of a frail membranous sheet stretched on a more solid framework, which supports it much as the costa and nervures support a wing.

The form, colour, and pilosity of these lobes differ specifically to such an extent, that many species can be distinguished at a glance by these characters alone. Not only the actual outlines, but even the minute veinings, cloudings, etc. of the membrane seem to be extremely constant. The only difficulty in examining them is that they are apt to curl over somewhat at the apices laterally, but even this curling sometimes contributes to their specific "facies." I have frequently dissected many specimens of one species from widely-different localities, and have nearly always found their seventh segments exactly similar, and quite unlike that of any other species. The cases in which two different species have this plate deceptively similar, are extremely rare; and curiously enough, where this *does* happen, the insects themselves are generally very unlike each other in external characters.

These segments have, for examination, at least one great advantage over the armatures proper. Their outlines are real *margins* and not mere variable *horizons* of solid figures, hence their appearance is much less affected by slight differences of position. Also being much less complicated objects, and less troublesome to focus under the microscope (being flatter), they produce an impression which is more quickly grasped and more readily remembered.

It is perfectly easy, with a little practice, so to prepare either fresh or relaxed specimens as to display this segment sufficiently for all practical purposes; or it can be actually removed and mounted separately without any noticeable disfiguring of the specimen, but in that case the ligaments connecting it with the dorsal plate must be severed cautiously first. In nearly all cases it forms a most beautiful microscopic object, whether it be mounted dry or in balsam.

In certain cases (cf. my last figures on Pl. VIII) a very singular appearance is given to this segment by a tendency which the lateral thickened portions or "costæ" show to *detach* themselves from the lobes and stand up as separate tooth-like or spine-like processes. This leaves the lobes comparatively unsupported (cf. fig. 33*a*), or they may even disappear almost entirely, so that only a sort of skeleton of the segment remains to represent it (fig. 35*a*). One can trace, I think, a regular gradation in this respect—the likeness of the modified segment to the simple *semi-annulus*, from which it must have developed, decreasing stage by stage, till it vanishes altogether.

It is curious to note how in different genera of the Anthophila nature seems to select different ventral segments of the ♂ for paradoxical specific modification—the sixth in certain Osmiæ, the seventh in Colletes, the eighth in Andrena, both the seventh and the eighth in Prosopis—while in other cases none of these segments are particularly characteristic, and it is the armature itself which supplies the best specific characters (*e. g.* in Bombus and Sphecodes). I have already noted that these modifications are not confined wholly to the concealed portions of the abdomen; and indeed I suspect that its entire structure (the *emboîtement* of all its segments, the development of ventral tubercles on some of them, the usual acumination and occasional peculiar armature of its apex, etc.) depends a good deal on the same sort of causes, which have diverted the concealed ventral segments from their original function as a part of the insect's integument, and made them a sort of appendage to the *armatura copulatrix*.

We come now to the "armature" proper, which comprises at least three obviously distinct portions, viz. its cushion-like base—the *cardo*, and two objects, each resembling a pair of forcipes, one within the other—the outer of which (following Thomson and Saunders) I call the *stipites*, and the inner the *sagittæ*.

The *cardo* has little character, and need not detain our attention; but the *stipites* and *sagittæ* are very differently formed in different species, and undoubtedly give to some armatures a peculiar and easily recognizable facies. Yet it is often not easy to define exactly the characters on which the peculiarity depends. This is partly because these organs, being practically very irregular figures of three dimensions, completely alter their appearance, when

the aspect in which we view them is even slightly changed. Consequently, to get a real idea of their structure we must look at them all round, and the more we do this the more we find that the characters which strike the eye at once in some particular aspect can no longer be recognized if the point of view be ever so slightly changed. (For this reason, as well as because of its comparatively simple character, I greatly prefer the characters of the seventh segment to those of the armature—they are both more positive, and more recognizable in different positions of the object.)

However, let us suppose that an armature is lying perfectly flat before us with its dorsum uppermost, and see what characters may be then observed in it.

First, as to the *stipites*. Each of these will generally *appear* more or less evidently three-jointed. There is a pilose, somewhat palpiform, and often pale *apex*—a longer and much broader *central* portion—and (separated from the last by what looks like a transverse suture) a large sub-triangular or sub-reniform *basal* lobe—bulging inwards so as to meet the corresponding lobe of the other stipes below the *sagittæ*.

This is the commonest type, and when it occurs we can take into account the forms of the three apparent joints which compose the stipes; the comparative length and breadth of each (individually or as compared with the other two); the straightness, convexity, sinuation, etc., of their outlines; the extent, density, and length of the pilosity at the apex, etc. In all these points the stipes of a particular species will present characters which seem to be constant, and will help to distinguish it.

In other cases, as Radoszkowski has pointed out, we can see no suture defining the basal portion of the stipes. In some such armatures the pilose apices are exceedingly long and narrow; in others much less so. The pilosity in this group is generally very much developed, and differs a good deal in its arrangement in the different species.

Next as to the *sagittæ*, we see—or rather seem to see, for the appearance is very different from the reality—two strips or rods of chitin lying side by side, dilated at the base into lobes which are sometimes sharply angled laterally, while their apices generally look pointed and sometimes divergent. To each of these rods laterally is attached a sort of membranous "wing" or "sail," called by Radoszkowski the "fourreau," not flat, but bent and folded

in various ways—sometimes looking much longer than the rods, sometimes not so—in some parts quite glassy, but in others often more or less dark and opaque. Besides these "wings" the rods may, or may not, have other lateral appendages or dilatations of rather thicker and darker substance, and these sometimes give the impression of a sharp triangular tooth projecting over the base of the more transparent "wing."

"Characters" presented by the *sagittæ* in this aspect are —the outline and extent of the basal dilatation of the "rods"; the shape, size, colour, and foldings or twistings of the membranous "wings"; the presence or absence of a *secondary* (often tooth-like) *dilatation* of the rods as above described (between their *basal* dilatation and the "wing"); the length of the *sagittæ* as a whole in proportion to that of the *stipites*, etc. But all these characters are liable to become—I will not say *impossible*, but *difficult* to recognize if the organs are (as often happens) accidentally shrunk or displaced ever so little, or if the armature as a whole is not lying in exactly the proper position. I must repeat, therefore, that, for practical purposes, I greatly prefer the characters of the seventh segment.

As soon as we begin to examine the armature in other points of view than the direct dorsal aspect, we shall find that the description given above of the *stipites* and *sagittæ* requires a good deal of modification. Thus, looking at the *stipites* (Plate IX) sideways, we see at once that they are never really three-jointed, but composed of a single curiously-folded sheet, which is nearly but not quite completely chitinized throughout; the apices look no longer in the least palpiform, but more or less broadly triangular; the supposed suture dividing the stipes transversely is seen to be merely a superficial though often deep sulcation in it, etc. Again, looking sideways at the *sagittæ* (Pl. IX), we find that the dorsal view has not shown us their real apices at all—the latter are so sharply deflexed, that when we viewed the organ dorsally they were completely out of focus, and in fact out of sight. We have also to correct our former impression of the "wing" as something distinct from the "rod," and attached to it as a sail to a mast—it is really nothing but a difference in the degree of chitinization which makes them look distinct objects. The truth seems to be that each *sagitta* consists of a single sheet of substance, folded and "crinkled" up in a complicated

fashion (especially towards its base), and much more thoroughly chitinized in certain places (especially along its inner margin and all over its basal part) than elsewhere. All the appearances in it of tooth-like processes, etc., are really produced by *foldings* of the substance, foreshortened in various ways according to the point of view. In fact the whole apparent structure of the object as viewed in the flat field of a microscope is simply a mass of optical illusions. Still the phenomena themselves, however deceptive, are *constant* in each species, and can therefore be used to furnish us with specific characters, if we have sufficient familiarity with microscopic work not to be misled by the εἴδωλα of the "optic glass."

When the armature is viewed from behind, a curious object with a bifid or bilobed apex appears to protrude from the inner side of each stipes, close to and partly covering the bases of the sagittæ. This is called the *volsella*. It has in some points of view the appearance of a distinct organ, partly imbedded in the stipes, but I think it is really only a peculiarly folded portion of the stipes itself—at any rate I have never succeeded in removing it without bringing away part of the stipes with it. The lobes at its apex differ in shape and size a good deal in different species (Pl. IX, 41, 42, 43), and might give good characters if they were more conveniently placed for examination. Sometimes they are pretty conspicuous even in the dorsal view of the armature, but more usually they are hidden by the dilatations of the sagittæ. The opposing faces of the lobes seem to be covered with rasp-like denticulations or tubercles, and I think they must have some prehensile function, but they do not seem to have any power of movement apart from that of the *stipes* as a whole.

The armatures which I have figured are rendered semi-transparent by immersion in Canada balsam. This causes a pair of divergent rod-like, perhaps tubular, objects to be seen indistinctly through the surface of the stipites, which on dissection are found to proceed from the bases of the sagittæ, and are part—I suppose—of the apparatus by which the latter are moved. (I have not attempted to take characters from them, as they cannot be seen without special preparation of the armature.)

Such of my figures as represent neither armatures nor seventh ventral plates are intended to render more

intelligible the Tables now to follow, in which I do my best to distinguish the ♂♂ of such palæarctic Colletes-species as are known to me by *such characters only as can be seen without dissection.*

I am bound to say at once, that I think we can hardly expect quite satisfactory results from an inquiry which begins by setting aside the most positive marks of difference which Nature has stamped on the creatures we are endeavouring to distinguish. Therefore it does not surprise me that, after attempting to deal with the matter under such limitations, the results I have reached do not even to myself seem very satisfactory. However, such as they are, I will offer them to my readers.

Apart from colour (including that of the pilosity, which depends a good deal on the condition of the specimen, and sometimes on other causes than that of specific identity), the most conspicuous differences that I see between one Colletes ♂ and another lie in (*a*) size; (*b*) surface sculpture of the body, especially its puncturation; (*c*) the structure and proportions of certain parts of the insect, especially the head, the antennæ, and the legs; and perhaps also in certain cases (*d*) the infuscation or the reverse of the wings, including their nervures.

Of these, the size of the insect is only in certain cases of much use in "determining" it. The average size of most species, when one is compared with another, differs little; and particular specimens in all of them may be much larger or smaller than the average. Of course the biggest *nanus* is much smaller than the smallest *nasutus*; but out of a mixed lot of (say) *succinctus*, *fodiens*, *montanus*, *picistigma*, and *daviesanus*, the biggest specimen and the smallest might equally belong to any of the species.

The sculpture-characters are much more to be trusted, but they are extremely difficult to describe in unmistakable terms:—*e.g.* such an expression as "fine puncturation," a "close puncturation," conveys different ideas to different minds, and even to the same mind at different times. Each reader measures such expressions by a standard of his own, and even that standard is liable to vary.

In the shape and relative proportions of the head, etc., we do at last arrive at characters which can be stated *positively*. But even here, it is surprising how difficult it is to be quite sure that one sees what one thinks one

sees. To estimate correctly (*e.g.*) the relative length of two antennal joints seems a simple matter; yet even here the most practised eyes will sometimes be deceived. Again, the comparative length and breadth of the *gena* in a particular insect is a definite fact; yet unless it be placed in exactly the right position when we measure it, the best micrometer will measure it quite wrongly.

And as to infuscations, etc. of the wings, there are but few Colletes-species in which such characters can be employed to any purpose, and even in these species the phenomenon is apt to be inconstant.

Accordingly in constructing tables for Colletes based on such characters, I am simply making the most that I can of unsatisfactory materials. The fact is, that throughout the whole genus the external structure is particularly simple and uniform: strong paradoxical characters such as help us to classify other genera are here scarcely to be found * without dissection of the insects. And though in quite fresh specimens the colour and disposition of the pilosity in certain species may be adequate to distinguish them for certain, a slight amount of fading or rubbing will make almost any Colletes practically unrecognizable by such characters. Whatever its original colours may have been, it speedily bleaches into a dull uniform grey. The fasciæ which now look white may once have been distinctly yellow; and those which are now widely interrupted, may or may not have once been entire. Hence, if we are to determine at all any but exceptionally perfect specimens, we can do so only by employing structural characters; and these in Colletes are, as we have seen, for the most part minute, easily misinterpreted, and still more easily misrepresented when we try to express them in a verbal description.

If then my Tables prove to be of practical use to hymenopterists, I shall be glad; if not, I shall not be much surprised.

The length of the gena being perhaps the most conspicuous of the external characters, I have taken it as my first ground of division. But I do not at all think that it divides the species into real natural groups. (Cf. the figures of genæ in Plate VI, which, different as they are, belong all to insects which I believe to be nearly

* The scutellar appendages of *græffei*, Alfk., are an isolated exception.

related.) Certain differences of pilosity (*e.g.* nearly naked or, on the contrary, almost villose discs of the abdominal segments) are perhaps of real phyletic significance, but all sorts of intermediate conditions occur, and I prefer as far as possible to employ characters which depend less on the freshness, etc. of the particular specimens examined. As to my measurements of antennæ, legs, genæ, etc., I have made them with great care; but I cannot hope that I have always avoided errors, for when such objects are measured microscopically, the slightest inaccuracy in placing them produces a fallacious image, and falsifies the measurement accordingly.

TABLE OF EXTERNAL CHARACTERS.

1. Genæ extremely long, their (least) longitudinal diameter quite twice the breadth of the mandible at its base ... ... 2.
   Genæ evidently elongate, but decidedly not twice as long as the base of the mandible is broad ... ... 3.
   Genæ subquadrate, their (least) length about equalling the breadth of the mandible ... ... 5.
   Genæ transverse or short, two-thirds as long as the breadth of the mandible or less ... ... 15.
   (For the above characters, consult the Figures of genæ and heads in Plates VI and IX.)
2. Abdomen coarsely and rugosely punctured. Face, between eyes, very long, narrow and parallel-sided. (Pl. IX, 36) ... ... 15. *nasutus*, Smith.
   Abdomen with minute distinct punctures. Face very long, but wide above, the eyes converging. (Pl. IX, 39) ... ... 34. *formosus*, Perez (? = *lacunatus*, Dours).
3. Abdominal fasciæ definite and conspicuous ... ... 4.
   Fasciæ indefinite or absent. Large, circ. 15 mill. long ... ... 33. *cunicularius*, Linn.
4. Second abdominal segment clothed on its disc above with long pale hairs. All the fasciæ wide. Species rather small, circ. 10 mill. long ... ... 16. *coriandri*, Perez.
   Disc of second abdominal segment with short fuscous hairs. Fasciæ towards the apex of the abdomen becoming very narrow. A much larger species than the last, circ. 13 mill. long. Cordiform area of the propodeum with a narrow shining triangle forming its apex, but its base and disc occupied by a series of transverse parallel rugosities (Canary Islands, etc.) ... ... 5. *dimidiatus*, Brullé.
5. Sixth ventral plate with a well-defined small and deep oval fovea, impressed transversely on each side of its disc, some way from the sides and apex of the segment. (Pl. IV, 52) ... 6.
   Sixth ventral plate without such definite discal foveæ, though sometimes broadly depressed or excavated on each side of a central carina. (Cf. Pl. IX, 53) ... ... 7.

6. Punctures of basal abdominal segment above much larger and coarser than those of the second segment. Fasciæ rather wide and in fresh specimens generally more or less yellowish. Circ. 11 mill. long. (Universally distributed species, ranging from North Europe to Egypt, and common everywhere) **30.** *succinctus*, Linn.
   Puncturation much more uniform and very fine. Fasciæ narrow and white. A larger species, circ. 13 mill. long. (Mediterranean region) ... ... **29.** *frigidus*, Perez.
7. Sides of seventh dorsal plate of abdomen much constricted, making its apex somewhat mucronate (Pl. IX, 43*a*) ... ... **32.** *acutus*, Perez
   Seventh dorsal plate shaped otherwise ... ... 8.
8. All the abdominal fasciæ entire, broad, and uniform ... ... 9.
   Some at least of the fasciæ are narrow, or interrupted, or obsolete ... ... 12.
9. Very large, circ. 15 mill. long. Disc of second dorsal plate with long pale hairs ... ... **14.** *bracatus*, Perez.
   Much smaller. Second dorsal plate not very pilose, apart from its fasciæ ... ... 10.
10. Very small, circ. 7 mill. long. Wings opalescent with pale reddish-yellow stigma and nervures. Hairs of head and thorax above white ... ... 11.
    Larger, circ. 10 mill. long. Wings simply hyaline with darker stigma and nervures. Hairs of head and thorax above pale brown (Greece) ... ... **3.** *cecrops*, n. sp.
11. Third abdominal segment punctured much like the second. Fasciæ quite as broad as the spaces between them (Egypt, Tunis) ... **21.** *nanus*, Friese.
    Third abdominal segment punctured much less closely than the second. Fasciæ distinctly narrower than the spaces between them (Algeria) ... ... **22.** *pumilus*, n. sp.
12. Six well-defined abdominal fasciæ, the fifth more or less narrowed laterally and the sixth extremely narrow throughout. Circ. 10 mill. long (Greece, and South Italy) ... ... **17.** *phalericus*, n. sp.
    Either the fasciæ are more or less indistinct or even absent; or, if well defined, those towards the apex are as broad as those preceding them ... ... 13.
13. The whole clypeus except its extreme apical margin is strigose longitudinally and strongly punctured between the strigæ ... ... **26.** *montanus*, Morawitz.
    Part at least of the sides and apex of the clypeus are smooth with only a few large sparse punctures ... ... 14.
14. Fasciæ almost obsolete; punctures of abdomen intensely fine and sparse, apex of basal segment almost impunctate ... ... **31.** *impunctatus*, Nyl (= *alpinus*, Mor.).
    Fasciæ distinct, punctures of abdomen, though fine and sparse, are much less so than in *impunctatus*, and the apex of the basal segment is punctured throughout ... ... **25.** *mongolicus*, Perez.
15. Scutellum with conspicuous unciform lateral processes (Pl. IX, 45). Wings dusky. Metatarsus posticus very broad ... ... **28.** *graffei*, Altken.
    Scutellum simple ... ... 16.

16. Dorsal surface of abdomen peculiar, showing in places a sort of irregular transverse rugulosity or striolation together with numerous very shallow punctures. The latter vary in shape and size, and have rather ill-defined margins. They are partly "elevated," and sometimes become almost confluent transversely. The extreme apices of the segments are smooth and whitish. Their discs are clothed with pretty long suberect hairs. The colour of the pilosity seems to be mainly cinereous, that on the thorax rather fuscous than fulvous (but all my specimens are much faded). The sixth ventral segment has a well-marked central carina. The labrum is scarcely tubereulated or foveated. The anterior and intermediate tarsi seem particularly long and slender, scarcely half as broad as the posterior. The insect is rather large, circ. 13 mill. long. The wings sometimes (but not always) evidently with a yellowish stain ... ... **35.** *cariniger*, Perez (? = *collaris*, Dours).

Punctures of abdomen above either large and strong, or, if fine, at least pretty deep and well-defined (circular) upon a smooth ground ... 17.

17. Discs of intermediate abdominal dorsal plates clothed with longish sub-erect hairs. Intermediate joints of tarsi postici considerably dilated, cordiform, at least half as broad as long (Pl. IX, 59, 60, 61) ... ... 18.

Discs of intermediate dorsal plates very shortly pubescent or naked. Intermediate joints of tarsi postici narrower, evidently not half as broad as long (Pl. IX, 62, 63) ... ... 21.

18. Intermediate joints of tarsi postici broader than long. Wings faintly clouded. Discs of abdominal dorsal plates strikingly hirsute. A large Mediterranean sp. 12–13 mill. long... **11.** *abeillei*, Perez.

Intermediate joints of tarsi postici not or scarcely as broad as long. Species smaller, and all occurring commonly in northern districts ... ... 19.

19. Puncturation fine and sparse. Fasciæ narrower, the hairs forming them scarcely half as long as the erect hairs on the disc of second segment. Sixth ventral plate dentate laterally and not carinated in the centre (Pl. IX, 50) ... ... **18.** *daviesanus*, Smith.

Punctures much closer and stronger. Fasciæ wider, their hairs about as long as the erect pilosity. Sixth ventral plate evidently carinated in the centre (Pl. IX, 53) ... ... 20.

20. Second joint of tarsi postici (Pl. IX, 60) more produced and dilated at the apex exteriorly, making the very oblique apical margin as long as the interior. Antennæ longer. Fasciæ of a purer white. (Pilosity of body and legs a little shorter and less copious) ... **19.** *picistigma*, Thoms.

Second joint of tarsi postici (Pl. IX, 61) less dilated and produced, the apical margin is therefore less oblique and evidently shorter than the interior. Fasciæ with a creamy tinge. Antennæ shorter ... ... **12.** *fodicus*, Kirby.

21. Wings distinctly clouded with fuscous-yellow... ... 23.
Wings clear or nearly so ... ... 23.
22. Larger, circ. 13 mill. long. Abdomen finely punctured on a smooth shining ground, with narrow white fasciæ ... ... **20.** *spectabilis*, Morawitz (=*niveo fasciatus*, Dours).
Smaller, circ. 10 mill. long. Abdomen very coarsely sculptured, with large rugose punctures, and strong (*Cerceris*-like) abrupt constrictions between the discs of the segments **13.** *punctatus*, Mocsáry.
23. Third joint of antenna as long as the fourth. A small insect with short antennæ, and very short genæ (their least length is not a fourth of the width of the mandibles). Sixth ventral plate with a pilose tuberculation at each lateral angle and a wide pale apical margin. Pedes postici with very slender tibiæ and tarsi ... ... **23.** *brevicornis*, Perez.
Third joint of antenna evidently shorter than the fourth. Genæ at least a third of the width of the mandibles, often much more ... ... 24.
24. Fifth ventral plate punctured (subrugosely) all over—the punctures seem both larger and closer than those on the preceding segments. Cordiform area of propodeum for the most part longitudinally rugose, somewhat obliquely ... ... **24.** *marginatus*, Smith.
Fifth ventral plate otherwise punctured ... ... 25.
25. The disc of the fifth ventral plate (*see* Pl. IX, 51) is occupied by a large impunctate triangular space, nearly equilateral, whose sides, defined by dark lines, converge from the base of the segment to near its apex, where the triangle ends in a small pale rounded fovea. Outside this triangle the surface is punctured and pilose. (A small Mongolian sp. circ. 8 mill. long.) ... ... **27.** *ventralis*, Perez.
Fifth ventral plate sculptured otherwise ... ... 26.
26. Sixth ventral plate (Pl. IX, 49) with a rather conspicuous oval patch of dense dark-looking pilosity bordered by an oblique fovea near each of its lateral angles. Last dorsal segment slightly incised at apex (sub-bilobate) **6.** *ligatus*, Er.
Sixth ventral plate without conspicuous pilose patches as above; at most with a thin loose tuft or pencil of pale hairs ... ... 27.
27. The whole abdomen, including its basal segment, very closely, finely, and evenly punctured above, so that the surface is uniformly almost dull ... ... 28.
The puncturation is much less close and regular, with shining intervals, on the basal segment it is conspicuously larger and more sparse than on those following ... ... 29.
28. Slightly larger and especially broader than the next species, circ. 12 mill. long. Fasciæ broad and yellowish. Hairs of thorax above rich fulvous-red. Eyes very slightly converging (Egypt) ... ... **4.** *perezi*, n. sp.
Fasciæ somewhat narrower and snow-white. Hairs of thorax above cinereous yellow. Eyes rather strongly converging, making the face look more triangular and the clypeus narrower (Algeria) ... ... **9.** *etaoni*, n. sp.

29. Middle joints of antennæ (Pl. IX, 54) about as broad as long (they seem to be flattened in a peculiar manner beneath). Face very short and broad, differing evidently from all the following species, except perhaps *caspicus* (See Pl. VI, 8*a* and 10*a*). A small species, circ. 7 mill. long. (S. France) ... ... **10.** *chobauti*, Perez.

Middle joints of antennæ considerably longer than broad. Species larger ... ... 30.

30. Area trigona of propodeum crossed by large clathrate rugosities, its lateral areas also largely rugose, looking in some lights almost strigose. Eyes not very convergent. Apex of seventh dorsal plate narrowly rounded, almost pointed ... ... **7.** *hylaiformis*, Eversm.

Disc of area trigona mostly quite smooth; the lateral areas punctured, rugosely, but with no appearance of strigosity ... ... 31.

31. Apical half of sixth ventral plate abruptly depressed; its central part is pale shining and almost impunctate. Face wide and short with eyes converging strongly: the vertex elevated. Dorsal apex much as in *hylaiformis*. Hind tarsi rather wide—the first joint not above *four* times as long as broad (*six* times in the species following!) ... **8.** *caspicus*, Morawitz.

Sixth ventral plate less sharply sculptured, and its central part evidently rather largely punctured. Apex of last dorsal plate wider, subtruncate, with a slight central incision. Face squarer, the eyes converging only slightly. Lateral areas of propodeum not so strongly and closely punctured ... ... { **1.** *balteatus*, Nylander,& **2.** *eous*, n. sp.

I can at present give no external character that satisfies me for separating these two. (See below, Notes on the Species.)

Notes on the Species Figured.

Species with unincised stipites 1–10.

1. *Balteatus*, Nyl. (?). Pl. VI, fig. 1, 1*a*, 1*b*. Pl. IX, figs. 63, 64.

I call this species *balteatus* on the authority of Prof. Perez and several other correspondents from whom I have received it. But whether it is really Nylander's species I do not know. If, as I believe, it does not occur in Northern Europe, it obviously cannot be the *balteatus* of Thomson.

Nylander first proposed *balteatus* as a name for Latreille's *succinctus*, which he considered not to be the *succinctus* of Linné. But I can find nothing either in Latreille or Nylander to show what the insect really was which Latreille called *succinctus*. Several species seem to me

to suit all that is said by either author quite as well as the present.

Radoszkowski's *balteatus* is certainly *marginatus*, Smith, and I believe Thomson's is the same.

In its armature and seventh ventral segment the present insect resembles very closely the four species next to be figured. But it differs in that the stalks or petioles from which the lobes of the seventh ventral plate spring are *evidently pilose*. They have a continuous ciliation of well-developed hairs, proceeding from definite punctures, which commences nearer the base of the segment than the point at which the lobes begin to spread from it.

In the armature all five species agree (*a*) in the narrow elongate *un-notched* stipites, which contract very gently in the dorsal aspect, but rapidly in the lateral (Pl. IX, 64), to form the slender and very pilose apical process; (*b*) in the manner of folding (rather than the actual outline which depends on a variety of accidents) of the dilated sagittæ. The more transparent part of this (the "fourreau") consists of *two laps* (one basal, the other apical) *which partly cross each other*, and in so doing produce the effect of a triangular sub-opaque thickening of the membrane. These laps are further overlapped by a *third fold* which is *chitinous and triangular*, occurring at the point where the sagittæ (viewed laterally, Pl. IX, 64) are bent downwards almost at a right angle, and this is really about half-way between their bases and their apices, though in the dorsal view the deflected apical halves are so foreshortened that this is not easily realized. Between the bases of the sagittæ and the stipites the volsella peeps out, of course at a much lower level, and therefore only to be seen properly by altering the focussing.

All this group agree as to the seventh segment in the *gradual* dilatation of sub-triangular and petal-like lobes from elongate stalk-like and apically sub-acuminate interior "costæ." The clouding, etc. of these lobes is also very similar. They differ chiefly in their *degree* of dilatation (more or less rapid) and in the outline of their actual apical margin, to see which properly, however, the object must be viewed in more aspects than one.

In external characters they agree in being all very shortly haired on the discs and conspicuously banded at the apices of the segments. The fasciæ are entire, and there is usually—perhaps always—a distinct basal fascia

also on segment 2. The legs in all are rather slender, and the third antennal joint is always shorter than the fourth. In puncturation they differ considerably, and also in the length of the genæ, the sculpture of the propodeum, and the structure of the apical segments both dorsal and ventral. These differences seem enough to separate them as distinct species, but I feel sure that they must be very near relations.

Balteatus seems to be a fairly common and widely distributed species in the Mediterranean and also in the Alpine districts (Spain, S. France, the Adriatic, Switzerland, Tyrol, etc.). I have taken it quite high up on the Simplon Pass. It is not British, nor (I believe) does it occur in Scandinavia or North Germany—hence it is unlikely that Thomson's *balteatus* is this species.

Though Radoszkowski figures our *marginatus* as "*balteatus*, Latreille" (sic),* he also figures what I think must be the present species under the name "*marginatus*," which name of course it cannot bear in any case.

Prof. Perez at one time identified this species with *lacunatus*, Dours, under which name it is placed in some collections. But Dours's description does not suit it in the least, and M. Perez tells me that he accepted the identification on the faith of a correspondent, and has now abandoned it.

A correspondent sent me a ♂ and ♀ of this species as "*sierrensis*, Frey Gessner," and I have myself taken it *at Sierre!* But I have not seen Frey Gessner's types, and another insect that has come to me under the same name is certainly *marginatus*, Smith. If *sierrensis* really = my *balteatus*, I should be inclined to adopt the former name, as there really seems no particular reason for identifying our insect with Nylander's species.

2. *Eous*, n. sp. (?). Pl. VI, 2, 2*a*.

Species a *balteato* vix distinguenda, nisi segmenti septimi ventralis lobis magis elongatis, apicem versus minus dilatatis, margine apicali vix sinuato, et praecipue petiolis loborum nudis (nec ciliatis nec punctatis), fortasse quoque numero (13) hamulorum in alis inferioribus. ♂ long. circa 10 mill., ♀ latet.

Helenensdorf, Transcaucasia (?), Pola (?).

* *Balteatus*, Latreille, is a nullity. *Succinctus*, Latreille = *balteatus*, Nylander.

I am rather unwilling to separate this from *balteatus*, with which it agrees in almost every particular. But the difference in the seventh ventral plate is remarkable. (Prof. Perez has seen my dissections and agrees with me as to this.) The lobes are differently shaped, and their petioles are absolutely impunctate and unciliated. To this I may add, that in the one specimen whose *external* characters I have examined for this paper—two others I seem to have unfortunately mislaid, and can at present only find the *dissections*—there are thirteen hooks in each wing (a number which also occurs in all my specimens of *perezi*), whereas in *balteatus* I have never found more than eleven. But I fear this character is not reliable, for my solitary specimen of the next species (*cecrops*) has thirteen hooks in one wing and eleven in the other!

Whether *cous* is a true species, I must leave to be decided by those who can tell me what "a true species" really is. But I have found the pilosity of the concealed segments so constant a character in all the genera in which I have examined it, that for the present I must regard it as specific. The absence of the characteristic hairs in my specimens of *cous* is not due to accidental depilation, for the punctures from which they should originate are wanting also.

My one remaining entire specimen of *cous* ♂ is from Helenensdorf, Transcaucasia, sent me by Herr Koul of Vienna. It is not in such a condition that I can say whether in fresh specimens it might be distinguished from *balteatus* by external pilosity-characters. In structure, except as to the alar hooks and the naked "petioles" of the seventh ventral plate, I have failed to find any difference between them that I can regard as clearly specific, and unfortunately I do not know *cous* ♀.

3. *Cecrops*, n. sp. Pl. VI, 3, 3*a*, 3*b*.

Balteato simillimus, cum quo facile confundi potest, sed genis multo longioribus (pæne quadratis!), etiamque segmenti ventralis septimi petiolis bases versus haud ciliatis, ut opinor, certe discedens.

This insect again comes exceedingly near to *balteatus*, but its genæ are evidently longer, so that in my Table it is placed among the species with sub-quadrate genæ. They are also irregularly rugose, or rugosely punctured, longitudinally almost all over, while in *balteatus* there is a wide

smooth space between the basal rugosities and the apex. The *apical* part of the "petioles" in the seventh ventral plate is very densely ciliated with pale whitish hairs, but not in the style of *balteatus*, where the hairs are looser, darker (I think), and commencing much nearer to the base of the segment.

If a distinct difference in the length of the genæ is not to be regarded as a positive specific character in Colletes, it is hard to see on what grounds we are to establish species among them at all: if it *is*, then certainly *cecrops* and *balteatus* differ. Thus we come back to the question, "What is a species?" to which, for my part, I know no thoroughly satisfactory answer. In the meantime, I hold *cecrops* to be distinct.

I have only one specimen (♂), taken by myself in Attica (April 30, 1901).

4. *Perezi*, n. sp. Pl. VI, 4, 4*a*.

♂ *Balteato* affinis, sed maior (10–13 mill. long.), abdomine longe subtilius æqualiusque punctato (propterea magis opaco), fasciis abdominalibus latioribus, flavidis subsquamosis. Segmenti ventralis septimi petioli nudi, basibus dilatatis. ♀ (long. circa 15 mill.) a *balteato* ♀ notis iisdem, quibus mas, differre videtur.

Aegyptus, prope Cairo, iv et v, 1896.

This is a species which, though it has almost all the other characters of *balteatus*, distinguishes itself at a glance by its exceedingly different puncturation. This is intensely fine and close throughout, making the discs of the abdominal segments look remarkably opaque. The fasciæ also are seen at a glance to be very much wider. These in fresh specimens are decidedly flavescent, and formed of more than one distinct row of very thick (almost scale-like) branched hairs. It is rather larger than *balteatus*, and has thirteen alar hooks. I know it only from Egypt, where I have taken both sexes near Cairo. Possibly it may be identical with some of the species described by Spinola (e. g. *intricans*, not however if Radoszkowski rightly identified that species!), but I cannot fit it satisfactorily to any of them. I have named it therefore after Professor Perez, in acknowledgment of much kind assistance received from him during this inquiry.

5. *Dimidiatus*, Brullé. Plate VI, 5, 5*a*, 5*b*.

The largest species of the group, and very distinct by its

exceedingly long cheeks, sparsely punctured, shining abdomen, and narrowish white fasciæ (especially those towards the apex). The sculpture of the propodeum is also somewhat peculiar: its base is occupied by clathrate rugosities, or rows of adjacent foveæ, which gradually diminish, and become vaguer as they approach the narrow shining triangle at its apex.

I know the species only from the Canaries, etc. (the region from which came also Brullé's types).

(In the ♀ the genæ are not particularly long, less so decidedly than their greatest breadth. In the ♂ they *look* even longer than they are in proportion to their breadth, an effect which seems to be due to their convexity, or to something in the disposition of the hairs. In the armature figured the apices of the sagittæ were unluckily distorted by pressure of the cover-glass. Normally I think they would look much as in the other species, almost linear—being viewed in profile only.)

6. *Ligatus*, Er. Pl. VI, 6, 6*a*, 6*b*. Pl. IX, 49.

The name *ligatus* was first employed by Illiger, who however did not describe his species. Erichson's description is of a ♀ from Spain, and, as is usual with these early descriptions, would suit equally well a number of species. Following Prof. Perez, I adopt the name for a species of which I have dissected three or four ♂♂ from various Mediterranean districts (that figured is from Barcelona, and Erichson's description is fairly suitable for it, though inadequate).

The ♂ has a strong external character in the well-marked dense tufts, in some lights looking almost velvety, which adorn the lateral angles of the last visible ventral segment. It is finely and rather sparsely punctured with shining interspaces.

This species, and the four which follow, agree with the last five in having the stipes *unnotched*, but differ from them in having the lobes of the seventh ventral plate much more transverse, and developed more abruptly, so that one may distinguish in them a basal as well as a lateral exterior margin (they might be called *quadrilateral*, the others being *trilateral*). But what is still more conspicuous is that they spring not from elongate "petioles," but from comparatively broad and stumpy "trunks." (The condition

in *ligatus* is somewhat transitional, in the others it is impossible not to recognize it instantly.)

The armature of *ligatus* is not unlike that of the previous species (*balteatus*, etc.), but differs in the much greater (broader and longer) triangular chitinous dilatation of the sagittæ at their point of deflexion. This occupies a much larger part of their dorsal aspect, and looks nearer their bases than the smaller (apical-looking) triangles in the other species.

The *colour* of the seventh ventral plate is very dark, making the broad hyaline space at the apex of each lobe particularly conspicuous. All my specimens have the same bold oblique (downwards and inwards) curl or roll of the lobes. It seems hardly possible to flatten them out completely without splitting them by the pressure. So they must be somewhat rigidly chitinized in parts.

7. *Hylæiformis*, Evr. Pl. VI, 7, 7*a*, 7*b*. Pl. IX, 46.

8. *Caspicus*, Morawitz. Pl. VI, 8, 8*a*, 8*b*, 8*c*. Pl. IX, 47.

I shall treat of these two species together, as they seem near allies, and their synonymy is at present somewhat entangled.

The questions whether and how they differ are best determined by consulting the writings of Morawitz who was the original describer of *caspicus*, and who also wrote a careful re-description of *hylæiformis* from examination of Eversmann's type-specimens, the original description being, he tells us, altogether inadequate.

The conclusions to which a study of these descriptions brings me are supported by the evidence of specimens received under the names respectively of *hylæiformis* (from Prof. Perez and Herr Kohl) and *caspicus* (from Prof. Perez only). *Hylæiformis* ♀ is at once separable from *caspicus* ♀ by its thoroughly squamose style of pilosity, and *hylæiformis* ♂ from *caspicus* ♂, both by the external characters given already in my Tables and (at a glance) by the armature, in which each apex of the unnotched stipes is narrow and elongate in *hylæiformis*, while in *caspicus* it is a broad, blunt, almost equilateral triangle. (See Pl. IX, 46 and 47.)

The species, however, which Radoszkowski calls *hylæiformis* (and also his *floralis*, probably *not* = the *floralis* of Eversmann!) is figured with an evidently blunt and short

apex to the stipes. As Radoszkowski has no species called *caspicus* in his Revision, while Morawitz, as we have seen, knew thoroughly both species, I feel practically certain that Radoszkowski dissected a *caspicus* not knowing it to be such, and wrongly assigned it to *hylæiformis*. And what he called *floralis* was probably another specimen of the same insect, indeed he himself suggests this as probable. (The true *floralis* seems, from what both Eversmann and Morawitz say of it, to have been very different from either *caspicus* or *hylæiformis*, and very likely did not belong to the group of *unnotched* stipites at all. But what it was, I have no idea. It must be a very small insect: 7–8 mill. sec. Morawitz.) Therefore, I think *hylæiformis*, Rad. (*nec.* Eversm., *nec.* Moraw.) is a synonym of *caspicus*, Morawitz.

Several of Radoszkowski's figures might possibly be referred to the true *hylæiformis*, e. g. his *anceps*, *mixta*, and *carinata*, are all more or less suggestive of it.

I never took *hylæiformis* myself, but have met with *caspicus* in several Mediterranean countries, and received it from others and also from Transcaucasia. It seems to be widely distributed, therefore, and probably is one of the common species of its group. Prof. Perez takes it at Royan, near Bordeaux.

The sagittæ of *hylæiformis* and *caspicus* seem very similar. Their most striking character is perhaps the large tooth-like fold of sub-opaque (but not thoroughly chitinized) substance which spreads out from them near the bases, overlying and partly hiding the base of the more transparent "wing." Above this fold is another dilatation of the sagitta, less conspicuous in the dorsal aspect because seen only in profile, but also looking dentiform when viewed laterally. This is more solid—in fact it is completely chitinized and black. It appears to correspond, though its situation is very different, to the triangular dilatations at the bend of the sagittæ in *baltcatus*, etc.

In both species the lobes of the seventh ventral plate spring from short broad bases—not elongate petioles. In most of my specimens the outer apical corners are curled or rather creased diagonally into a sort of "dog's-ear," and when this happens the segment assumes an outline which always reminds me of a bishop's mitre as represented in heraldry. As compared with *ligatus* the lobes are more

elongate, and the sinuation of their apical margin hardly so strong. Their discs are also as a rule much less deeply infuscated.

Two further points about the synonymy of *hylæiformis* are puzzling.

(1) Morawitz says that the species is probably identical with *nasutus*, Smith. Yet as he describes it, it is evidently as different as possible from the latter, which is perhaps the most unmistakable species of the whole genus. I can only suppose that Morawitz did not know the real *nasutus* when he revised Eversmann's collections.

(2) V. Dalla Torre gives "*hylæiformis*, Perez," as probably = *acanthopygus*, Dours. But certainly the *hylæiformis* ♂♂ I have received from Prof. Perez and Herr Kohl by no means answer to Dours's description of *acanthopygus*. The latter should have a strong spine at the apex of the abdomen. Such a spine in a Colletes-sp. I never saw. Is it possible that Dours has been deceived by some ♂ in which a stipes of the armature accidentally protruded from the abdomen? (His "types" seem to have disappeared.)

9. *Eatoni*, n. sp. Pl. VI, 9, 9*a*, 9*b*.

Simillimus *caspico*, sed abdomine multo subtilius et æqualius densissime punctulato. Pilositas mesonoti pallida, non nihil flavescens. Fasciæ abdominalis densæ, latissimæ, niveæ, in ♀ vix minus quam in *hylæiformi* squameæ. ♂ stipitibus ut in *caspico* formatis, scilicet apicibus haud productis sed oblique truncatis. Genæ breves. (Corp. long. ♂ circa 10 mill., ♀ circa 12 mill.)

This beautiful insect is closely allied to *caspicus* by the structure of its armature and seventh ventral plates, but easily distinguished from it in both sexes by the extremely fine, close and even puncturation of the abdomen, and in the ♀ by the shorter and paler pilosity, which on the abdomen, though not on the thorax, is almost as squamiform as in *hylæiformis*. It appears to me to stand to *caspicus* much in the same relation as *perezi* to *baltcatus*. The first abdominal segment is densely clothed at the base with white pilosity; there is also a dense basal band on the second segment, which, as well as all the apical fasciæ, is entire, very broad, and of the purest silvery-white; the pubescence on the discs of the segments is very short and dark, making the fasciæ show up very sharply in contrast

with it. The ♂ sixth ventral plate resembles that of *caspicus*, it has pretty long but not very thick penicilli at its lateral angles, a scarious margin, and a smooth pale longitudinal space in the middle of the disc. In both sexes the thorax above has a close and very even (as though shorn) pilosity, paler than in *caspicus*, being rather yellowish-brown than fulvous. Beneath, and on the face, propodeum, and legs, the hairs are pure silvery-white. Other characters are given in my Tables.

The specimens examined, the only ones I have seen, were taken in Algeria by the Rev. A. Eaton, after whom I have named it.

Radoszkowski's figure (in *H. E. S. R.*, v) of his *C. kirgisicus* much resembles the ♀ of *eatoni*; but its wings look very dark, while they are quite clear with pale nervures in *eatoni*. And his description is so inadequate, that I cannot even be sure to what group even his species really belongs. He described only the ♀.

10. *Chobauti*, Perez. Pl. VI, 10, 10*a*, 10*b*. Pl. IX, 54.

A small species from South France kindly communicated to me by its author; and the last known to me of the section with "unnotched stipites."

In the seventh segment the base reminds me most of *caspicus*, the apex of *ligatus*. The armature seems very distinct by the very broad, well-developed "fourreau," with its appearance of a strong narrow (almost linear) chitinizing of its substance near the base of each exterior margin, by the slighter triangular sub-chitinous dilatation which overlies the fourreau, and by the apices of the stipites which have neither the very elongate character of those in *hylæiformis* and *ligatus*, nor the short, broad, triangular form of those in *caspicus* and *catoni*.

Externally the structure of the head and antennæ, together with its small size, separate it easily from anything known to me.

Species with *notched stipites* 11–35.

11. *Abeillei*, Perez. Pl. VII, 11, 11*a*. Pl. IX, 59.

This species also I have received from the author. Both in the armature and the seventh ventral plate it seems to have some affinity with the species following, and

externally both are pilose, strongly punctured insects, with short cheeks, rather short antennæ, and dilated tarsi. But *abeillei* is much the larger species.

In the armature of *abeillei* the "apical process" of the stipes is short and inconspicuous (except for its dense but rather short pilosity); the "middle part," *i. e.* that above the "notch," is rather elongate, and has a pointed look, the outer margin (or rather "horizon") curving inwards towards the apex as though to meet the straight inner margin at an angle of about 30°. The sagittæ are only moderately dilated near the base, but the fourreau is particularly large and solid-looking; it is very wide at the apex, not only extending close up to the stipes, but curling round and returning thence towards the middle of the armature—doubled back over itself, as it were. Besides this doubling of the membrane, which alone would make it somewhat opaque, it has an actual dark stain over a considerable part of its substance, and appears even to some extent chitinous. The whole colour of this armature is unusually dark, and the seventh ventral plate, except its extreme apical border, is dark also, its lateral thickenings or "costæ" almost black. The form of this segment is rather simple; its lobes are wide and sub-triangular, with the corners rounded off, their surface slightly concave (ventral view), but not strongly curled up at the sides as in *ligatus*, etc., their actual apical margins straighter perhaps than in any species of the group, though the apical outline of their infuscated discs is evidently sinuated.

12. *Fodiens*, Kirby. Pl. VII, 12, 12*a*. Pl. IX, 61.

This is a common British species, and I have taken it also in Switzerland. It often occurs on *Senecio*, and I have found it accompanied by *Epeolus productus*.

The armature is very distinct by the unusually elongate central portion of the stipites, their very inconspicuous and only slightly pilose apices, and the extremely dark "wings" of the sagittæ, which, however, are hyaline at the apices.

The outline and colouring of the seventh segment also distinguish the species immediately from any other. It is generally very dark as a whole—almost black in places, but with sharply-defined hyaline spaces at the apex and near the base. Its apical margins are gently sinuated in the middle, and gently rounded on each side of the sinuation. The segment is distinctly more produced in the

apical direction near its centre than at the sides—a character which appears more strongly still in the next species.

13. *Punctatus*, Morawitz. Pl. VII, 13, 13*a*.

My specimens (from Pest) were given me by Herr Friese. I never found it myself.

The armature and seventh ventral plate have a certain resemblance to those of *fodiens*. But their colour is much paler; the stipites are very differently formed, their central portion being comparatively short and broad, while the apical portion on the contrary is very elongate and strongly pilose; there is a peculiar thickening of the membrane at each apical outer corner of the "wings" in the sagittæ; and the lobes of the seventh ventral plate are much more narrowly rounded at their apices—almost pointed.

A character common to this species and the two last is the truncate appearance (at the apex) of the "wings" of the sagittæ. This is unusual in the genus; the "wings" are generally either rounded apically or produced into a form resembling the point of a penknife.

14. *Bracatus*, Perez. Pl. VII, 14, 14*a*.

I have received this very large and handsome species from the author. Specimens taken by myself in Egypt agree with it exactly, both externally and in the characters of the armature and the concealed segments. These have been described by Herr Friese under the name *grandis*, but Prof. Perez's name is the older, and must be adopted.

The form of the seventh segment and the disposition of its cloudings to a certain extent recall those of *fodicus*, but the apical margin has a different (double) sinuation, and the colour is extremely different—the lighter parts being yellowish, and the darker a beautiful orange-red.

The armature is quite unlike that of any preceding species. The stipites, indeed, are not unlike those of *punctatus*, but the sagittæ are altogether of another type. The "wings" are nearly clear, only faintly yellowish, and the more solid part has two distinct basal dilatations, the more apical of which is not—as is usual in such cases—dentiform.

15. *Nasutus*, Sm. Pl. VII, 15, 15*a*. Pl. IX, 36.

This is another very large species—one of the few which

can be distinguished at a glance by its external characters, the long parallel-sided face, etc.

Its armature and seventh ventral segment show affinities to those of *bracatus*, but the secondary dilatation of the sagitta (between the basal dilatation and the "wing") is very evidently dentiform.

The lobes of the seventh segment appear less transverse, partly perhaps because they curl inwards much more strongly; their cloudings are also very different.

The species examined were sent to me by Herr Kohl and Herr Friese.

16. *Coriandri*, Perez. Pl. VII, 16, 16*a*. Pl. IX, 37.

17. *Phalericus*, n. sp. Pl. VII, 17, 17*a*.

I treat these two species together, as their dissections are practically identical. Their external characters, however, separate them at once; especially their heads are constructed quite differently, so that they fall under different sections in my tables.

The simple almost circular lobes of the seventh ventral plate are unlike those of any other species known to me. The wings of the sagittæ are produced far beyond their apparent apices, much as in *daviesanus*, but with a different outline. There is a secondary dilatation—not dentiform—between the basal dilatation of the sagitta and its wing.

Coriandri is an Algerian sp. I have examined a ♂ determined by the author, and sent to me by M. Vachal, and another taken in Algeria by Mr. Eaton.

Phalericus I have taken freely in Greece and also in South Italy and at Cerbère—the eastern end of the frontier between France and Spain. Its diagnosis follows.

Niger, sed ♀ apice ventrali fere semper testaceo; nitidissimus, abdomine subtilissime omnium punctulato (in segmento basali disperse, in reliquis multo densius). Genæ in ♂ subquadratæ, in ♀ margis transversæ. Antennarum art. 3^{tius} (♂) 4to subæqualis. Mesonotum griseo-brunnescente (vix fulvido) mediocriter pilosus; segmentorum abdominalium disci fusco-subpilosi, apices decolorati, fasciis albis integris, quarum ultima (in ♂ saltem) longe angustior quam basales videtur (♀ segmentum abdominis secundum fasciam basalem quoque distinctam exhibit, quae in maribus meis omnibus aut detrita est aut omnino deest). Segmentum ventrale ♂ sextum basi leniter bicallosum, reliqua segmenta ventralia apicibus plus minusve triangulariter in medio scariosis.

From the circumstance that the sixth ventral segment in the ♀ is almost invariably testaceous, it seems to me possible that this, and not the species I have above accepted as *ligatus*, is the species described under that name by Erichson. He gives this character, and I have not observed it in the ♀ ♀ of what I have called *ligatus*. But without a great deal more material I should not venture to do more than throw out this as a suggestion.

Prof. Perez has kindly sent me the dissected apex of a species which, after seeing my *phalericus*, he considers to be distinct from it. I do not see myself that the dissections differ from my own of *phalericus*. If the two species are identical, his name—*foveolaris*, Perez—will have priority over mine.

But considering that *coriandri*, a very different species from *phalericus*, shows the same dissection characters, I am quite prepared to believe that *foveolaris* is a third distinct species of the same group. As I have only seen its dissection, and not examined the insect itself, it does not of course appear in my Tables.

18. *Daviesanus*, Smith. Pl. VII, 18, 18*a*. Pl. IX, 41, 50.

The commonest species in this country, and widely distributed over Europe.

Its seventh ventral plate could only be confounded with that of *brevicornis*, from which species the greatly produced apices of the wings in the sagittæ distinguish it immediately. The external characters of the two species are very different.

19. *Picistigma*, Thoms. Pl. VII, 19, 19*a*. Pl. IX, 53, 60.

Not uncommon in certain localities in this country, it occurs also in the Alps, and Thomson describes it from Scandinavia.

The seventh ventral plate is extremely distinctive, it is curled laterally in such a manner, that (viewed either dorsally or ventrally) the lateral margins of the lobes look quite straight and perpendicular, they also seem to project in the basal direction beyond the basal margins of the lobes, forming with them a sort of angular incision in which appears a peculiar fringe of diagonal hairs. The apical margin of each lobe has a sort of tooth-like production before it meets the interior margin, which contrasts

strongly with the rounded outline of this part in *fodiens*, *daviesanus*, etc., and allies it rather to *succinctus*. The armature is, on the whole, not unlike that of *daviesanus*; but the apical productions of the "wings" in the sagittæ are less marked than in that species. Yet the difference seems to me hardly so great as the figures in Mr. Saunders's synopsis would suggest.

20. *Spectabilis*, Morawitz. Pl. VII, 20, 20*a*.

This is generally called *niveofasciatus*, Dours, and I have little doubt that the identification is correct. But I am also convinced that the female at least is that which Morawitz described as *spectabilis*; and as his description appeared before that of Dours, I adopt his name.

The forms both of its armature and seventh ventral segment are most peculiar, and distinguish it at once. Radoszkowski has luckily figured the latter along with the armature of his *niveofasciatus*; and though the figure is exceedingly rough, its outlines unmistakably indicate the present species.

As to the armature, it will probably suffice if I call attention to the elongate and attenuated character of all its parts, to the peculiar forceps-like prolongation of the apices of the sagittal "wings," and to the singular appearance of the volsella, which is much more prominent than usual—prominent even in the direct dorsal view.

I know the species from Greece, Italy, South France, and Spain.

21. *Nanus*, Friese. Pl. VII, 21, 21*a*.

This was originally described from specimens, ♂♂ and ♀♀, which I took in Egypt, near Cairo.

The armature and seventh ventral plate have a certain resemblance (but too slight to cause any confusion) to those of *spectabilis*.

The insects themselves have no similarity whatever, and could not possibly be confounded.

22. *Pumilus*, n. sp. Pl. VII, 22, 22*a*.

This is so like the last species externally, that until I dissected them I never doubted that the two were identical; and Herr Friese himself, on comparing my specimens with his types of *nanus*, at once declared them to be the same.

The armatures, however, and still more conspicuously the seventh ventral plates, make it impossible, I should say, to unite them. And having separated my specimens by these characters, I can now detect other slight differences in them which I mention in my Tables.

Personally I have taken *nanus* only in Egypt, and *pumilus* only in Algeria. But M. Vachal has sent me a specimen from Tunis, which I can only call *nanus*; so that probably that species occurs in Algeria also, though I did not meet with it there.

The almost equilaterally triangular lobes of the seventh segment in *pumilus* are quite unique in the genus, as far as I know it. Yet possibly we may see in them the beginnings of such a modification as has produced the extraordinary "tails" of *impunctatus* described below.

23. *Brevicornis*, Perez. Pl. VII, 23, 23*a*. Pl. IX, 38, 56, 62.

All my examples of this species are from the Alps. The author records it from Sicily.

I have mentioned above the likeness of its seventh ventral plate to that of *daviesanus*. The lobes, however, spring from more elongate and altogether larger basal "trunks," which give the segment as a whole a different outline.

It will be noticed that in my figure the apices of the stipites point *outwards*. But probably no stress should be laid on this, as these apices have certainly some power of independent motion in the living insect, and though in dried specimens they usually turn inwards, I have found occasional instances to the contrary among examples of other species.

24. *Marginatus*, Smith. Pl. VIII, 24, 24*a*.

As to the determination of this species there can be no doubt. Nothing occurs in this country which could be confused with it, and Smith's types were British insects. It seems to be very generally distributed over Europe, and I have dissected specimens from the most remote localities —one even from the interior of Asia—with precisely similar results.

The apices of the stipites, in this and several of the species following, look decidedly pale, broad, and rather triangular than palpiform even in the direct dorsal view.

Their middle part has a more or less bulging external outline—less noticeable, however, in this particular species than in some near it, e. g. *montanus*. The sagittæ have a very noticeable dentiform dilatation between the basal dilatation and the "wing." The pilosity at the apex of each stipes is decidedly rather long and copious.

The seventh ventral segment in *marginatus* has a distinct facies of its own. Its outlines are rather angular than rounded—note especially the lateral projections towards its base. It is mostly nearly colourless, but with yellowish costal thickenings. Though it has certain points of likeness to the same segment in two or three of the other species, it could hardly, I think, be confused with any of them.

It is, perhaps, scarcely necessary to repeat that Radoszkowski's figure of "*marginata*, Smith," has nothing to do with this species, but represents one of the *balteatus* group.

On the other hand, *balteatus*, Rad. (*nec.* Perez), certainly *does* represent our British species, his type having been received (as he tells us) as *marginatus* from Mr. E. Saunders, and his figure, though hardly good, being at least recognizable.

25. *Mongolicus*, Perez. Pl. VIII, 25, 25*a*.

I have received this species from the author, and also (unnamed) from Herr Kohl.

Its armature closely resembles that of *marginatus*, but the seventh ventral plate distinguishes it at a glance. This, alone among the species with "divided stipites," has the sort of outline (long petioles and bilobed apices) which characterizes the *balteatus* group, and yet it could hardly be confused with any of them.

I cannot point to any case which illustrates better than the present the value of the characters of the seventh ventral plate for determination of obscure Colletes species. *Mongolicus* and *marginatus* both occur in Mongolia, and their armatures are practically not distinguishable. Yet by the seventh ventral plate, as well as by sufficient though minute external characters, they are unmistakably shown to be distinct species. And in a third Mongolian species, to be dealt with below, we have again the armature of *mongolicus* and *marginatus*, but a seventh ventral plate which separates it at once from either of them.

26. *Montanus*, Morawitz. Pl. VIII, 26, 26*a*. Pl. IX, 42.

This species has recently been found in Scotland. I have several times met with it in the Alps, and I suspect it is that recently described from Scandinavia by Aurivillius as *suecica*.

The armature is of the same type as *marginatus* and *mongolicus*. The dentiform secondary dilatation of the sagittæ near their bases is for some reason less conspicuous —I fancy the volsella obscures it somehow—but it certainly exists, though my figure hardly shows it. The outline of the stipites, in their central part, is particularly bulging.

The outline of the seventh segment distinguishes it at once from any species yet mentioned. We see, as it were, a pair of rather stout but elongate columns with dilated "capitals" and a sharp lateral projection—sharper than that in *marginatus*—on each side near their bases. (The lobes in *spectabilis* and *nanus* are also elongate, but otherwise very different, their form being rather oval than column-like.)

27. *Ventralis*, Perez. Pl. VIII, 27, 27*a*. Pl. IX, 51.

I have examined two specimens, both from Mongolia. One was sent to me by the author; the other I received from Herr Kohl.

By its dissection-characters it should be nearly allied to *montanus*, but it is much smaller, and the external characters differ considerably.

The armature hardly differs from those of the three last specimens. The seventh ventral plate is much in the style of *montanus*, but the "columns" here are decidedly more slender.

(I feel sure that *mongolicus*, *montanus*, and *ventralis*, and probably also *marginatus*, belong to a real group; and next to them I should place the American species figured in Pl. IX, 57, 58.) In this group (assuming it to be one), as in that of *balteatus*, we find great differences in the length of the gena, making it probable (as suggested before) that this character throws little light on the *affinities* of species, though useful in distinguishing them *individually*).

28. *Græffci*, Alfken. Pl. VIII, 28, 28*a*. Pl. IX, 45.

I am enabled to figure this species through the extreme

kindness of Herr Friese, who actually allowed me to dissect his only specimen.

Its armature and seventh ventral plate seem to me as near to those of *marginatus* as to any other species. But the differences are considerable, and the unique external structure of the insect makes me think it better to consider it provisionally as standing alone in the genus. Should other species with toothed scutellum hereafter occur, it would be interesting to see how their "dissection-characters" compare with those of *græffei*.

29. *Frigidus*, Perez. Pl. VIII, 29, 29*a*. Pl. IX, 52.

30. *Succinctus*, L. Pl. VIII, 30, 30*a*. Pl. IX, 55.

In these two species—which agree *inter alia* in the peculiar foveation of the sixth ventral segment (Pl. IX, 52)—we come to a type of armature, etc. differing evidently very much from that found in *marginatus*, etc. The apices of the stipites are less conspicuous, more palpiform, and not nearly so pilose; the outlines of their central portion straighter—see especially the apical truncation and the exterior margin; the "wings" of the sagittæ are differently shaped, and though the latter have a secondary dilatation between the base and the "wing" it is not at all dentiform. The lobes of the seventh segment are not elongate but very transverse, recalling those in the neighbourhood of *bracatus* or *picistigma*, rather than those of *marginatus*, and differing "*toto cælo*" from those of *mongolicus* or *montanus*. In *frigidus* they are very hairy, and very small in proportion to the size of the insect. In *succinctus* they are much larger, nearly naked, and extremely transparent—so much so that under the microscope their apical margin, unless most carefully focussed, is apt to become altogether invisible. The costal thickenings in *succinctus* are of a beautiful and most delicate yellow; and the segment is altogether so frail and membranous that especial care is required to extract it undamaged.

Frigidus seems to be exclusively a Mediterranean species. My examples were received partly from the author and partly from Mr. E. Saunders.

Succinctus occurs universally from England and Scandinavia to Egypt, and its dissection-characters, as far as I can see, are everywhere the same.

In this country I nearly always find it on the purple

heather in late summer, but in Egypt I have taken it quite early in the year—on what plants I cannot remember, but certainly not on heather.

31. *Impunctatus*, Nyl. Pl. VIII, 31, 31*a*.

I feel no doubt that the insect from which I figure belongs to Nylander's species, nor that *alpinus*, Morawitz, is a synonym of the same. All my examples are from the Alps, where it is tolerably common.

The seventh ventral plate is most peculiar, and alone would distinguish the species at a glance. If we imagine the hairy transverse lobes of a *frigidus* contracted into a more quadrate shape, and furnished each at its inner apical corner with a long horn or tail of exceedingly thin transparent membrane, we should get the condition which we actually find in *impunctatus*. The armature is much more ordinary. Its stipites are formed nearly as in *montanus*, but the sagittæ have only a single basal dilatation; and their "wings" either *are* narrower, or are so folded as to *look* so, with a pointed rather than a rounded apex—but this last I take to be mainly an effect of "foreshortening."

No other *Colletes*—unless possibly *pumilus*—has a seventh ventral plate with anything even remotely approximating to the apical tails of *impunctatus*, and in that species both the armature and the external characters are altogether different. If *impunctatus* has really special affinities with any other Colletes-species, it perhaps comes as near to *frigidus* as to any; but I should be more inclined to place it in a special group of its own.

32. *Acutus*, Perez. Pl. VIII, 32, 32*a*. Pl. IX, 43, 43*a*.

I have two males and two females of this very distinct species, all from Algeria.

The seventh ventral plate seems to me to exhibit in a rudimentary form the paradoxical modifications which become stronger and stronger in the species which follow. The interior "costæ" are detaching themselves from the "lobes" to stand up as separate spike-like processes, and the commencement of a similar change seems indicated by the sharp sinuation—almost an incision—near each outer extremity of the apical margin.

In the armature I see nothing to call for special attention, except the very large and conspicuous *volsella*.

33. *Cunicularius*, L. Pl. VIII, 33, 33*a*. Pl. IX, 40, 48.

This being so common and well-known a species—rare perhaps nowhere except in our own islands—I will merely point out the unusually attenuated "wings" of its sagittæ, and the detachment of the "costæ," both exterior and interior, from the lobes of the seventh ventral segment.

34. *Formosus*, Perez. Pl. VIII, 34, 34*a*. Pl. IX, 39.

35. *Cariniger*, Perez. Pl. VIII, 35, 35*a*.

In these extraordinary species, which must surely be nearly related in spite of considerable external differences, I may leave (I think) my figures of the dissection-characters to speak for themselves.

Formosus ♂, determined by its author, was sent to me by M. Vachal; *cariniger* I have taken myself in Egypt, and its female (I believe) in Spain, and I have also seen specimens (♂ and ♀) taken by the late Sir S. S. Saunders in the Balkan peninsula.

I am strongly inclined to think that *formosus* is the real "lacunatus" of Dours, and *cariniger* his "collaris." Everything at all distinctive that I can see in Dours's descriptions bears out this view; but as his types seem to have disappeared, and I do not know the ♀ of *formosus*, it is more prudent perhaps to adopt at present synonyms which are certain.

Explanation of Plate VI.

(Characters of Colletes ♂ ♂.)

1.	*balteatus*	armature	1*a*	seventh ventral plate.
2.	*cous*	,,	2*a*	,,
3.	*cecrops*	,,	3*a*	,,
4.	*perezi*	,,	4*a*	,,
5.	*dimidiatus*	,,	5*a*	,,
6.	*ligatus*	,,	6*a*	,,
7.	*hylæiformis*	,,	7*a*	,,
8.	*caspicus*	,,	8*a*	,,
9.	*eatoni*	,,	9*a*	,,
10.	*chobauti*	,,	10*a*	,,

5*b*	*dimidiatus*	gena	6*b*	*ligatus*	head
3*b*	*cecrops*	,,	8*c*	*caspicus*	,,
1*b*	*balteatus*	,,	9*b*	*eatoni*	,,
7*b*	*hylæiformis*	,,	10*b*	*chobanti*	,,
8*b*	*caspicus*	,,			

Explanation of Plate VII.

(Characters of Colletes ♂♂.)

11.	*abeillei*	armature	11*a*	seventh ventral plate	
12.	*fodiens*	,,	12*a*	,,	
13.	*punctatus*	,,	13*a*	,,	
14.	*bracatus*	,,	14*a*	,,	
15.	*nasutus*	,,	15*a*	,,	
16.	*coriandri*	,,	16*a*	,,	
17.	*phalericus*	,,	17*a*	,,	
18.	*daviesanus*	,,	18*a*	,,	
19.	*picistigma*	,,	19*a*	,,	
20.	*spectabilis*	,,	20*a*	,,	
21.	*nanus*	,,	21*a*	,,	
22.	*pumilus*	,,	22*a*	,,	
23.	*brevicornis*	,,	23*a*	,,	

Explanation of Plate VIII.

(Characters of Colletes ♂♂.)

24.	*marginatus*	armature	24*a*	seventh ventral plate.	
25.	*mongolicus*	,,	25*a*	,,	
26.	*montanus*	,,	26*a*	,,	
27.	*ventralis*	,,	27*a*	,,	
28.	*græffei*	,,	28*a*	,,	
29.	*frigidus*	,,	29*a*	,,	
30.	*succinctus*	,,	30*a*	,,	
31.	*impunctatus*	,,	31*a*	,,	
32.	*acutus*	,,	32*a*	,,	
33.	*cunicularius*	,,	33*a*	,,	
34.	*formosus*	,,	34*a*	,,	
35.	*cariniger*	,,	35*a*	,,	

Explanation of Plate IX.

36. *nasutus* head.
37. *coriandri* ,, (lateral view).
38. *brevicornis* ,, (lateral view).
39. *formosus* ,,
40. *cuniculurius* concealed dorsal plates.
41. *daviesanus* volsella.
42. *montanus* ,,
43. *acutus* ,,
44. *nasutus* eighth ventral plate.
45. *græffei* side of scutellum.
46. *hylæiformis* stipes viewed laterally.
47. *caspicus* ,,
48. *cuniculurius* ,,
43*a*. *acutus* seventh dorsal plate.
49. *ligatus* sixth ventral plate.
50. *daviesanus* ,,
51. *ventralis* fifth ventral plate.
52. *frigidus* sixth ventral plate.
53. *picistigma* ,,
54. *chobauti* antennæ.
55. *succinctus* ,,
56. *brevicornis* ,,
57. *sp.* ? (American) armature.
58. ,, seventh ventral plate.
59. *abeillei* tarsi postici.
60. *picistigma* ,,
61. *fodicus* ,,
62. *brevicornis* ,,
63. *balteatus* ,,
64. *balteatus* armature viewed laterally.

III. *On some Aberrations of* Lepidoptera. By Percy I. Lathy, F.Z.S., F.E.S.

[Read November 4th, 1903.]

Plate X.

The whole of the aberrations here described and figured are contained in the rich collection of Mr. Herbert J. Adams, F.E.S.

1. *Melinæa mauensis*, Butl.

A gynandromorphous example, the left side being female and the right male; this specimen is from Demerara.

2. *Amathusia andamanensis*, Fruhst.

A male with three ocelli on hind-wings below.

3. *Morpho cacica*, Stgr.

A male in which the submarginal white spots of fore-wing above are large and elongated; the discal pale band of fore-wing below shows through, in some lights giving the appearance of a band on the upper-side.

4. *Acræa terpsichore*, Linn. Pl. X, fig. 1.

A male with the black spots of hind-wing below much enlarged and elongated.

Received from Natal.

5. *Heliconius aristiona*, Hew.

A female with discal black spots of fore-wing absent, cellular and costal spots greatly reduced.

Taken by Messrs. Watkins and Tomlinson in Peru.

6. *Heliconius sara*, Fabr.

A female from Venezuela with the usual yellow markings white.

7. *Heliconius sprucei*, Bates.

A similar aberration to the preceding; obtained in Ecuador.

8. *Helieonius erato*, Linn.

Another female aberration in which the yellow markings are replaced by white; the red markings are more pinkish in tinge than in typical specimens.

This example came from Venezuela in the same parcel as *H. sara*, Fabr., mentioned above.

9. *Dione vanillæ*, Linn. Pl. X, fig. 2.

A female with all the black markings above increased and coalescent; the under-side differs little from typical specimens, except the cell of fore-wing is filled in with black.

This fine specimen was taken at Santa Barbara, California.

10. *Brenthis myrina*, Cram. Pl. X, fig. 3.

A male from Canada with discal black markings of both wings large and coalescent, in the fore-wing forming a wide black band.

11. *Pyrameis indica*, Herbst. Pl. X, fig. 4.

A remarkable aberration in which subapical white spots of fore-wing have disappeared, the lower one being indicated by an obscure reddish spot, the black markings in the red median band are also wanting; marginal red band of hind-wing much reduced, and the black spots replaced by a dark brown bar; the under-side of fore-wing differs from typical specimens in the same way as the upper-side, while the hind-wing is much clouded with brown, therefore rendering the markings obscure.

This beautiful form is from Travancore, S. India.

12. *Anartia jatrophæ*, Linn.

A female from Dominica, Leeward Islands, having four discal black spots to hind-wing above, the additional two which are smaller being placed between the usual two.

13. *Anartia saturata*, Stgr. Pl. X, fig. 5.

A female with the transverse markings of both wings obscure and diffused, ocelli absent, and submarginal orange brown patches greatly elongated at apex of fore-wing and absent in hind-wing; under-side with all markings very obscure, submarginal ones and ocelli absent, hind-wing with faint red scaling.

This most beautiful variety was captured by the late Mr. Priddey in Haiti.

14. *Callicore clymena*, Cram. Pl. X, fig. 6.

A male in which hind-wing below has submarginal black band, and band dividing figure of eight markings wider, and black spots larger than usual, these resembling *C. clymena*, Cram. ; the front discal band absent.

Taken in Peru by Messrs. Watkins and Tomlinson.

15. *Catagramma hydaspes*, Dru. Pl. X, fig. 7.

A male from Paraguay with black band beyond base of hind-wing below narrow and obscure, almost disappearing in cell ; submarginal black band wider, its inner edge diffused.

16. *Catagramma cyllene*, D. and H. Pl. X, fig. 8.

A male with the submarginal black band of the hind-wing below narrower and much further from margin, and the blue markings it contains more lunular in shape.

Another of Messrs. Watkins and Tomlinson's captures in Peru.

17. *Batesia hypoxantha*, G. and S.

A curious freak in neuration, the subcostal nervure of hind-wing being connected with upper discoidal nervure by a short bar ; this occurs on both hind-wings but in a different position, as on right wing the connection is formed some distance before submarginal black border, and on left wing on border.

18. *Amnosia decora*, Doubld.

A female with pale band of fore-wings below broken at middle median nervule.

19. *Hypolimnas bolina*, Linn. Pl. X, fig. 9.

A female with both wings above cream-colour, darker towards base and without markings, with exception of a little dark brown in and beyond upper part of cell of fore-wing and base of costa of hind-wing. Under-side of fore-wing very similar to upper but dark cellular markings less and enclosing whitish spots, a little dark clouding at anal angle ; hind-wing with a small dark mark at anal angle otherwise immaculate.

This specimen is from Fiji, and is a striking form even among the beautiful varieties that occur there.

20. *Hypolimnas misippus*, Linn.

A female with discal white spot on hind-wing above and below; this spot is faintly shot with blue above as in the male.

I received this specimen from Mr. G. F. Leigh, F.E.S., of Durban, Natal.

21. *Hypolimnas deiois*, Hew.

A male from Milne Bay, British New Guinea, having the usual white patch of hind-wing above replaced by a very small bluish one very similar to that in *H. paleutes*, Grose Smith.

22. *Godartia eurinome*, Cram.

I have already described this aberration of the female. Trans. Ent. Soc. Lond., 1903, p. 193, n. 109.

23. *Euphædra franeina*, Godt.

A male from Sierra Leone with subapical yellow band of fore-wing obsolete.

24. *Chlorippe vacuna*, Godt.

A male from Espirito Santo, Brazil, in which discal spots of fore-wing above are white instead of orange.

25. *Archonias eurytele*, Hew.

A male from Columbia has the usual yellow markings replaced by white.

26. *Hesperocharis hirlanda*, Stoll.

A male with ground-colour of both wings above pale yellow.

This and the following variety were taken by Messrs. Watkins and Tomlinson in Peru.

27. *Hesperocharis nereina*, Hopff.

A similar aberration to the preceding.

28. *Dismorphia astynome*, Dalm.

A female from Paraguay with the usual reddish-brown markings above yellow.

29. *Delias belisama*, Cram.

A male with hind-wing above pale yellow.

30. *Prioneris autothisbe*, Hübn.

a. A male with discal area of hind-wing below yellowish-white and suffused with black scales.

b. A male with discal area of hind-wing below white.

31. *Prioneris sita,* Feld.

A male from S. India with nervules on both wings above and below widely bordered with black, in this respect resembling the female.

32. *Teracolus crone,* Angas. Pl. X, fig. 10.

A male with hind-wings above suffused with pinkish-brown, slightly iridescent.

Obtained in Natal.

33. *Troides urvillianus,* Guér.

a. A male with hind-wings above very densely scaled with black, and the black spots between nervules produced into bars which run into black scaling.

b. A male wanting black patch between median nervule and submedian nervure of hind-wing below.

34. *Troides papuensis,* Wall.

A pair with outer margin of fore-wings strongly incurved between middle and lower median nervules, in the female the outer margin of left fore-wing is also incurved near apex.

35. *Papilio ridleyanus,* White. Pl. X, fig. 11.

I described this pretty aberration in a previous number of the Transactions, June 1903, p. 203, n. 198, and now take the opportunity of figuring it.

36. *Papilio athous,* Feld.

Two males with fore-wing above devoid of white patch on inner margin.

37. *Papilio anchisiades,* Esp.

A male from Cayenne in which the usual red patches of hind-wing are blue.

38. *Papilio lycophron,* Hubn.

A striking aberration of the male in which the submarginal yellow markings of the hind-wing above have entirely disappeared, the under-side being normal.

39. *Papilio demolion,* Cram.

Three males from Nias with bands orange yellow.

40. *Papilio chaon,* Westw.

A male from Sikkim with left hind-wing below having submarginal yellow lunules much elongated at anal angle.

41. *Papilio thomsoni*, Butl.

A male with discal white patches on hind-wing below.

42. *Papilio joësa*, Butl.

A male in which the usual brilliant blue is replaced by dull silvery blue.

43. *Papilio memnon*, Linn.

A female from Sumatra with five large elongated greyish-white patches between nervules of hind-wing above ; this specimen belongs to the form which has red basal patch, and large white apical patch to fore-wing.

44. *Papilio gyas*, Westw.

I have already recorded this gynandromorphous specimen, "Entomologist," June 1899, p. 148.

45. *Papilio mikado*, Leech ? Pl. X, fig. 12.

The green markings are paler than in typical *axion*, Feld., more resembling the colours of those in *gordion*, Feld. ; fore-wing above with cellular and discal markings large, the subapical spots being coalescent, submarginal spots obscure ; hind-wing with nearly all costal area white, a long green fascia below subcostal nervure ; under-side of fore-wing as above, but with pale markings coalescent with exception of the three lower submarginal spots ; hind-wing with pale markings much extended and the red more diffused. This beautiful form came into Mr. Adams' possession with the Hourath Collection ; the specimen bears no locality, but is probably from Japan, as it appears to be intermediate between typical *mikado*, Leech, and the form figured by Mr. Wileman under the name of *albidus*, Entom. xxxvi, n. 487, p. 300, 1903.

Explanation of Plate X.

Fig. 1. *Acræa terpsichore*, Linn.
,, 2. *Dione vanillæ*, Linn.
,, 3. *Brenthis myrina*, Cram.
,, 4. *Pyrameis indica*, Herbst.
,, 5. *Anartia saturata*, Stgr.
,, 6. *Callicore clymena*, Cram.
,, 7. *Catagramma hydaspes*, Dru.
,, 8. ,, *cyllene*, D. and H.
,, 9. *Hypolimnas bolina*, Linn.
,, 10. *Teracolus eronc*, Angas.
,, 11. *Papilio ridleyanus*, White.
,, 12. ,, *mikado*, Leech ?

IV. *Notes on* Heterogynis canalensis, n. sp. By Dr. Thomas Algernon Chapman, M.D.

[Read February 3rd, 1904.]

Plates XI, XII, XIII, and XIV.

At the end of June and beginning of July last year (1903) Mr. Champion and I met with a species of *Heterogynis*, at Canales de la Sierra, which we took at first for *Heterogynis paradoxa*, but which is really very close to *H. penella*, and has fewer points in common with *H. paradoxa* than with *H. penella*.

It was attached to *Genista scorpius*, a plant that looked, to my eyes, very much the same as the common *Calycotome* of the Riviera, whenever at any rate it was allowed to grow at all freely ; usually, however, it was so browsed down by goats, sheep, and other animals, that it took the form of little rounded bushes a foot or two high, that were little better than very solid bundles of thorns. The grazing must be done entirely during the growing season, when some of the shoots that protrude are soft and succulent. I regarded as a most ungrateful task, the getting a portion of this plant and carrying it home for the food of larvæ.

There were several other Genistas at Canales, chiefly a tall handsome species, which I do not think was *Genista florida*, but was certainly in habit and general appearance very like it. Another, which I took to be *C. scoparius*, was also common.

I think I got one odd larva of *Heterogynis* from the *C. scoparius*, but, with this exception, not a specimen was found on anything but the *G. scorpius*. This close attachment to one plant was one of the items that made me at first think I had *H. paradoxa*. My experience of *H. paradoxa* is that it will eat nothing but broom, and as a rule only one species of broom in each locality. *H. penella* on the other hand will eat almost any leguminous plant, and even a good many others.

We met with various "brooms" at different parts of our excursion, and I searched this Florida-like species

thoroughly at Barbadillo, at Canales, and at Moncayo, and it, and others more superficially at other points of our journey, but nowhere else did *Heterogynis* occur than at Canales, and then only on the *G. scorpius*. This plant was a favourite food of *Orgyia aurolimbata*, and a considerable number of Geometers occurred on it; of these I only bred one or two, which proved to be *H. coronillaria*, *Euconista miniosaria*, and *Hybernia bajaria*.

This *Heterogynis* is in many respects very close to *H. penella*; as an imago it has a few points of distinction, which are probably quite trivial. On the larva the minute coronetted tubercles are slightly but definitely and constantly different from those in *H. penella*. There is, however, a remarkable difference in the habits of pupation of the female larva, and consequently in the habits of the imago, that appear to compel one to regard it as specifically distinct. Should any one prefer to regard it as a local race of *H. penella*, I should consider his personal equation in the matter, as being less typical than my own, but not as being of a very aberrant variety. I propose for the species the name of *Canalensis* from its habitat.

The ♂ imago has more the general facies of *paradoxa* than of *penella*, it is larger than *penella*, viz. 22 mm. against *penella* 20 mm., and is very constant at this expanse. It is nearer *paradoxa* than *penella* in the form of the wing, the hind margin being more oblique than in *penella*, less than in *paradoxa*, that is, the inner margin is definitely shorter than the costal, to a greater degree than in *penella*.

The fringe is decidedly shorter than in *penella*, viz. as 10 to 11, just the reverse of their wing expanse, at same point, 0·60 mm. to 0·66 mm., and the whole insect has a specially smoothed brushed-down aspect when beside *penella*.

It differs from both the other species in coloration. In these species both wings are very similar in coloration, but in *canalensis* the upper and under wings contrast with each other in the way that is so much more usual in *Heteroecra*. The upper wing has something of the dove colour of *paradoxa*, var. *candelariæ*, whilst the hind one is decidedly darker.

In view of the slight differences between the species of *Heterogynis* as imagines, it has often occurred to me to reflect, that in Lepidoptera generally, specific differences are very frequently confined to small differences of marking or colour, but in *Heterogynis* both marking and colour are

wanting, and so specific differences that might have been detected in this way have no means of expression.*

The genital armature of *H. canalensis* differs in no respect that I have been able to discover from that of *H. penella*. In both the apex of the *tegumen* is pointed, whilst in *H. paradoxa* it is bifid at the apex.

It also agrees with *H. penella*, in the larva in its first skin being without the stellate or coronate, secondary tubercles, which are present in *H. paradoxa* at hatching, and in both species are conspicuous in all the further larval stages (Plate XII).

In the full-grown larva, these curious points (photograped in Ent. Trans. 1902, Plate XXVIII, as they appear in newly-hatched *H. paradoxa*) are very different in *H. paradoxa* from the other two species, those of *H. penella* and *H. canalensis*, more nearly resemble each other. Though thicker and more robust than in the others, the coronets are in *H. paradoxa* only about half the size they attain in the other two species. The large spines are short and thick, about 0·03 mm. long, and the smaller or secondary spines are short blunt teeth, very few in number.

In *H. penella* the tubular base is larger and more cylindrical than in the others, and the long spines are seen to arise rather from its outer surface than from its margin; they do not widely diverge, they are about twice as long as those of *H. paradoxa*; the smaller or secondary spines are numerous, long, sharp and needle-like, and arise from the margin of the tubular portion, and may be seen passing round their margin, inside the larger spines.

In *H. canalensis* the form is more like that of *H. paradoxa*, the size that of *H. penella*. The base is wide and salver-shaped, the large spines spreading, and the secondary ones are even shorter than *H. paradoxa*, so short and blunt as often to appear to be absent.

These coronets vary very much in size in all the species, but between the species they not only compare generally as above noted, but the same differences are observable when those nearest in size and form are compared.

On comparing those of *H. penella* and *H. canalensis*, those of *canalensis* always have the tubular portion more open and salver-shaped, in *penella* it is straighter and more

* I see Professor Poulton in the President's address (Trans. Ent. Soc. 1903, p. lxxxii, lxxxiii) presents a very similar reflection, though with a somewhat different application in view.

tubular. In both, the long spines appear to arise rather just outside the upper rim than from its margin; in *H. penella* the rim often very distinctly passes round inside the long spines, and has short spines along this margin. In *canalensis* the margin rather folds over to the spine, or the inner surface of the spine opens out to either side into the margin, which inclines to fold inwards a little, and has irregularities rarely amounting to short blunt teeth, whilst the margin in *penella* is usually armed with a continuous series of long fine needles.

The cocoons of the three species of *Heterogynis* present good differential characters (Plate XI).

In *H. paradoxa* ♀ the cocoon is much larger than that of *penella*, and instead of being lemon-yellow is bright reddish. The larva spins first an outer delicate lace-like layer, beginning at the surface of attachment and spinning outward on each side a net-like veil, unites these above when they are large enough to meet. Within this is the true inner cocoon, which is similar to the outer one, but hardly as dense and strong; it is not far within the other, the space between being occupied by a comparatively slight web of connecting silk. The outer cocoon is more net-like than a mere fortuitous disposition of the silk would produce, there being numerous net-like holes, the margins of which consist of numerous strands of silk, giving the impression that the silk of *paradoxa* is coarser than that of the other species; it does not, however, appear really to be so.

The ♀ cocoon of *H. paradoxa* consists then of a definite separate net-like outer layer and an inner layer less dense and slung within the outer one by somewhat abundant threads, the inner and outer layer being frequently so far separated from each other, that the thickness of the wall of the cocoon may be from 3 to 5 mm. The ♂ *paradoxa* cocoon appears to have the same structure, but it proves practically impossible to separate it into two layers.

The ♂ *H. penella* cocoon is much the same as that of *H. paradoxa* ♂ as regards divisibility into layers, but agrees with the ♀ *H. penella* in the silk being fairly uniformly distributed, there being little or no aggregation into strands to form a network. The ♀ *H. penella* cocoon is comparatively small, looks fluffy, with outside silken threads, instead of smooth as in *H. paradoxa*, so that the method of spinning is probably different. I have not seen *H. penella* spinning its cocoon. It places it, however, like *paradoxa*

does, by preference, on a stem or stalk and not between two or more surfaces. Its structure looks uniform and the thickness of the wall of the cocoon is trifling, on section, however, it is found to consist of an inner and outer layer, closely fitting together, but with less connecting silk than the two separated but less definite layers of *H. paradoxa's* cocoon are united by.

The cocoon of the male of *H. canalensis* is not unlike that of *H. penella* ♂, that of the ♀ is very different. In the first place, it is never laid along a twig or stalk as is the typical position of the ♀ cocoon of the other species and of all the males. It is sometimes found amongst the thorns of the food plant, but perhaps more frequently under stones adjacent to the feeding place. It is necessary to it to have support on several sides. It is very large, 25 to 35 mm. long, 22 mm. across, and more or less in the third dimension according to its situation, against $25 \times 13 \times 13$ mm. for a large *H. paradoxa*, or $16 \times 8 \times 8$ for a well-sized *H. penella*. This outer cocoon often has some external spinning to fix it to its place of attachment, under (or between) stones, one side (or two) is attached to the stone. It is thin and transparent but very closely woven, and probably proof against a good many enemies. Centrally in this outer cocoon is an inner one that looks much like the ordinary cocoon of *H. penella*, but is frequently a good deal larger (17 or 18 mm. long, 16 being large for *penella*).

What are the homologies of this cocoon? When I first met with it, having only memory and no specimen by which to compare it, I thought it must be a variation of the cocoon of *paradoxa*. This, however, it certainly is not. The manner of spinning is that of *penella* and not of *paradoxa*. The colour does not at all agree with *paradoxa*, indeed it is paler than that of *penella*. It is rather a faintly flesh-tinted white than anything of the yellow of *penella*.

When one examines the inner cocoon, it is found to consist of two layers like the cocoon of the other species, but they are a little less easily separated.

The outer cocoon, then, is an entirely new structure not represented in the cocoon of either *H. penella* or of *H. paradoxa*.

This conclusion is fully confirmed when the function it fulfils is considered. It is a continuous envelope with-

out opening, valve, or weak place; the inner cocoon has the same valvular opening at top that the cocoons of the other species have, and through which the pupa partly emerges and again retreats. When this emergence of the pupa of *penella* and of *paradoxa* takes place, it comes into the open air, and the ♀ then emerges and finds herself fully exposed. But in the case of *H. canalensis* when the female emerges, she is still within the chamber formed by the outer cocoon. The position into which she emerges is free from any silken cords which elsewhere suspend the inner cocoon safely in the centre of the apartment formed by the outer cocoon.

When the male arrives he has to thrust his abdomen through such openings as he can make or find in the outer cocoon. I have twice seen this pairing take place, but could not be sure whether he had to discover some particular spot or whether almost anywhere at the right end of the cocoon was practicable. In other cases the male failed to reach the female, but this was probably due to the artificial conditions of my observations; the cocoon, not being left *in situ*, the right place would be difficult to find, and with cocoons spun in captivity, other larvæ spin over them, so as to destroy the proper structure.

The anal armature of the ♂ is well calculated to pierce such a web as the outer cocoon, and the movement for doing so, is very similar to that used by *penella* and *paradoxa* in finding their goal by searching over the smooth surface of the moth.

There can be no question that *Heterogynis canalensis* has a much more severe struggle for existence than the other two species; except perchance the *candelariæ* var. of *H. paradoxa*, which certainly concealed itself at all stages in a marvellous way, without varying in any very material degree from the other sub-species in order to secure this result. Taking *canalensis* as being close to *penella* we find it confines itself to a plant that is a solid mass of thorns, the female retires to form her cocoon to a place in the interior of the bush where thorns are especially thick and brittle, more rarely spinning in the centre of a living bundle of thorns. More frequently than remaining in the bush, she wanders to find a place under the bush amongst stones, which are usually plentiful enough where the *G. scorpius* grows, and in such stony places the *H. canalensis* is rather more frequent. We

often found several cocoons together in places under stones, sometimes half-a-dozen or more, usually all but one or two, rarely more, being old ones, looking indeed much like the new ones, except that the fine silky lustre of the fresh cocoon was wanting.

These habits seemed to render it practically impossible that birds, lizards, or such enemies should attack the species with any appreciable success, yet it is certain that Dipterous parasites and some Hymenoptera made great havoc amongst them, and of the old cocoons found under stones a very large proportion (two-thirds or three-fourths) contained the remains of a larva or pupa that had died apparently from such attacks. It was common in my boxes for one larva to spin over the cocoon of another in a way that was fatal, but I never found an unmistakable instance of this in the open.

In considering whether this species is or is not truly distinct from *H. penella*, several reflections occur. Chiefly it seems tolerably certain that a male of *H. penella* could not normally pair with one of *H. canalensis*, and it is doubtful whether a male of *canalensis* would successfully approach one of *H. penella*. This, in addition to the points I have already referred to, leads me to consider them distinct.

Of course the question of whether they are distinct species or not does not affect the interest attaching to the remarkable differences in habit. Whether in their divergence the two forms have or have not passed the point at which sub-species become species is no doubt a question of fact, they either have or they have not, but as the materials for definitely settling the point are wanting, we can only form an opinion from the available facts.

The species was plentiful enough at Canales, and though we did not see it, it probably occurs in various other places in this mass of Sierras, but it must be well segregated from other colonies of the genus as the Sierra is well surrounded by wide areas quite unsuitable to any Heterogynis.

For Explanation of Plates see next page.

Explanation of Plates.

Plate XI.

Cocoons of Heterogynis.

Figs. 1–3. *Heterogynis penella.*

1. Males.
2. Females.
3. Female cocoon cut open and inner cocoon partially pulled out.

4–7. *Heterogynis paradoxa.*

4. Males.
5. Females.
6. Female cocoon cut open and inner cocoon partially pulled out.
7. Cocoon before spinning of outer cocoon is quite completed.

8–16. *Heterogynis canalensis.*

8. Males with pupa cases attached.
9. Males without „ „
10–14. Females as made in varying situations.
15. Female cocoons in which the moths have died (and shrivelled) in the position of emergence showing them to be within the (special) outer cocoon. The unpleasing effect of the ill-managed (artistically) light background, must be excused, as it is effectual for its purpose of showing the situation of the moth.
16. Female cocoon, outer (special) cocoon (1) torn open and inner one (2) slit, and extreme inner one (3) removed to side, showing that the two inner (2 and 3) correspond to the outer and inner in the other two species.

Plate XII.

Larval tubercles (coronetted) of Heterogynis.

Figs. 1–4. *Heterogynis paradoxa.*

1. First instar, tubercle. × 400. First instar *penella* and *canalensis* are without these tubercles.

Figs. 2, 3, 4. Tubercles of last stage larva. × 250. Compared with other species they look thick and strong, and are short, about half their length. The short spines are very distinct, but short and obtuse.

5, 6, 7. *Heterogynis canalensis.*
Tubercles in last instar. × 250. They are wide, open and shallow, consequently many, in a prepared specimen, present themselves as fig. 6, opened out flat. The smaller spines are often absent, and when present are always few, short and rounded.

8–13. *Heterogynis penella.*
Tubercles in last instar. × 250. The basal or tubular portion is longer and narrow, may be nearly cylindrical, never so widely salver-shaped as in *canalensis*; in preparations, an open flattened one, as fig. 9, is rare and always distorted. The short spines are numerous, sharp, long and needle-like.

Plate XIII.

View of Canales de la Sierra (Province of Logroño) from the W.N.W., below a spur of the ridge to the North of the Valley. The distant point is to the North of the Cebollera.

Plate XIV.

Rough sketch map of the Sierra district between Burgos and Saragossa to give some idea of the position of Canales de la Sierra.

V. *An Entomological Excursion to Moncayo, N. Spain*, by George Charles Champion, F.Z.S.; *with some remarks on the habits of* Xyleborus dispar, *Fabr.*, by Dr. Thomas Algernon Chapman, M.D., F.Z.S.

[Read March 2nd, 1904.]

Plates XV. and XVI.

The excursion made by Dr. Chapman and myself to the Sierra de Bejar in 1902 having been a fairly successful one, we decided last summer to pay yet another visit to Spain, the irregular range of mountains lying about midway between the Pyrenees and the Guadarrama being our objective on the present occasion. The mountainous region selected was that included between the valleys of the Ebro and the Duero (Douro), commencing near Burgos and terminating eastward in the isolated lofty mass, 7600 feet elevation, known as Moncayo, the latter forming the boundary between the Province of Soria in Old Castile and Aragon. To the south of Moncayo the adjacent districts are of considerable altitude, while to the north the valley of the Ebro is very much lower, and backed by the distant range of the Pyrenees. The geological formation of these mountains, instead of being almost wholly granite, as in the Bejar and Guadarrama Sierras, is very varied, and includes a good deal of limestone; hence we anticipated that there would be a considerable difference in the insect-fauna, and this proved to be the case. The region visited was perhaps too far north for many special Spanish forms, a number of the species met with being common to the Eastern Pyrenees, still there was a considerable admixture of southern types. Leaving London on June 22nd, we travelled, *viâ* Paris, direct to Guéthary, in the Basses-Pyrenees, a pleasant seaside place not far from Biarritz; and after spending a few days there, continued our journey to Burgos. After a day or two here, we moved on to Canales, a centre suggested to us by the manager of the Sierra Company in Burgos, who was kind enough to furnish us with passes by the "Ferrocarril minero de Monterrubio á Villafria" to their present railhead at

Barbadillo, whence the rest of the journey—perhaps fifty miles in all—was made in a country cart. Later on, we shifted our head-quarters to Moncayo, two days' journey from Canales, and about sixty miles distant. On arrival at Canales, we were unable to obtain accommodation at the place recommended by our friends in Burgos, and as the public "posada" was extremely uninviting, we had to hunt up lodgings elsewhere, eventually finding rough quarters in an empty house, which proved, however, to be inhabited by legions of *Cimex lectularius*. This village is the uppermost one on the Najerilla river, an affluent of the Ebro, and just below the ridge separating the provinces of Burgos and Logroño, and as it was a good centre for collecting we remained there from June 27th to July 9th. Though rather low (elevation about 2500 feet), the adjacent mountains were accessible on all sides. These latter ranging up to quite 7000 feet, with the hollows near their summits still filled with snow. The northern slopes of some of the narrow valleys here are clothed with beech forest, and on the south side there is a good deal of oak scrub, which is very dense in places. On the ridge near the village of Huerta there is an extensive pine forest, and this proved to be a productive locality. The mountains elsewhere are clothed with heath almost to their summits, and here and there are patches of *Genista*, which, however, is not in sufficient abundance, when in flower, to give a colour to the slopes, as is the case at Bejar. From Canales two expeditions were made to a limestone cave—the Cueva de la Calera—but without success as regards cave-insects, the few beetles found about the mouth belonging to common species. In some of our excursions here the scarcity of water in these limestone mountains added not a little to the fatigue of the long tramp. Almost the only people encountered during these trips, apart from the occasional "pastores" or shepherds, were individuals engaged in cutting down the abundant asphodels for feeding their pigs, the plants being made into bundles, and carried down on their donkeys' backs. Leaving Canales on July 9th, we caught the diligence starting from Mansilla, a mining village a few miles down the valley, and reached Anguiano the same evening, the road for about three hours lying through the extremely picturesque gorge of the Najerilla (which is not mentioned in the guide books and is apparently unknown to tourists), the last-mentioned

town being situate at its mouth. Anguiano would probably be a good centre for collecting, but we were satisfied with one night there (the "parador" being a vast malodorous stable, with the living-rooms over it, as usual in Spain), leaving at 4 a.m. next day, by the diligence for Logroño. At Logroño, a large city on the Ebro, and the centre of the rich wine-producing district of the Rioja, in the vicinity of which a terrible railway accident had occurred a few days previously, we took the train to Tudela, for Tarazona, arriving there the same evening. After spending a day in this old cathedral city on the Queiles (another affluent of the Ebro, and nearly dry at this season), the extremely narrow streets in the upper part of it reminding us of Cuenca and Albarracin, we made our way up to the old Santuario or Monastery, dedicated to Neustra Señora de Moncayo, five hours distant, involving an ascent of about 4000 feet. Here we were fortunate enough to obtain good accommodation, thanks to the kindness of José M. Sanz Artubucilla, the priest-in-charge, staying from July 12th to 24th. The first half of the journey from Tarazona—usually commenced at 4 a.m. — was through ground cultivated with olives, vines, maize, etc., alternating higher up with brick-fields, an extensive scrub of deciduous oaks growing among loose stones being then entered, followed as we ascended by a broad belt of beech forest. Immediately above this was the Santuario, well sheltered from the wind by a great square mass of perpendicular blackish rock, known as the Peña Negra. Hence to the wind-swept summit the slopes, except where covered with loose shale, are clothed with heath, mostly of a very sweet-smelling, white-flowered species, which when in blossom harboured an immense number of minute insects, appearing to be even more attractive to them than the scattered *Genistæ*. The summit itself, often enveloped in cloud during our stay, has a scattered growth of tussocky grass, etc., affording sufficient pasturage for the numerous goats and sheep that are often taken up there. From the Santuario, which is uninhabited in winter, owing to the large accumulation of snow, a magnificent view is obtained of the broad valley of the Ebro, the river appearing as a mere silver thread from this elevation (5300 feet*), backed by the entire range of the Pyrenees, the Pic de Néthou, the Maladetta group,

* The elevation of the "hermitage" is given in *Murray's Guide* as 275 feet below the summit, this being probably a misprint for 2750.

etc., being clearly visible when the usual summer haze clears off after rain. The storm on the night of July 22nd along the Pyrenees afforded a pyrotechnic display never to be forgotten, vivid flashes of forked lightning from several points at once being almost continuous for several hours, and throwing up into strong relief the serrated black mountain ridges. The Ebro valley, seen from this height, and when the sun is shining, is of a very uniform brick-earth tint, the parts raised above the level of the river looking like flattened terraces of baked mud, and very few trees are visible. From the summit there is a very extensive view of the Province of Soria, and to the south-east the mountains stretching northward from the Sierra de Albarracin; eastward, too, the city of Zaragoza could just be discerned. The beech forest is confined to the northern slope, extending downwards for about 1500 feet below the Santuario, and in the more open parts of this, especially along the unused "carretera" or cart-road, there are plenty of Umbelliferæ, etc., attractive to insects. An excursion was made one day to the Cueva de Agreda, on the western slope, but as before, without result, as the mouth of the cave, owing to its close proximity to the village, served as a corral for goats at night—the interior, in consequence, being very dirty and smoke-blackened. During our stay at this place we were joined for a time by an enthusiastic veteran entomologist, Father Navas, of Zaragoza, whose chief study is the Neuroptera and Trichoptera; he gave us a good deal of local information, and accompanied us on several of our outings. Leaving Moncayo on July 24th, we made our way on foot over the very rugged forest-clad slopes to Agreda, travelling thence by the diligence southward to Soria, an old town on the Duero. On arrival at this place, we found the season too far advanced to make collecting profitable, there was therefore nothing to be done but to return by the way we came, so on the morning of July 26th we left by the daily diligence to Tarazona (8 hours' journey), taking the train thence to Pamplona, 7 hours further on.

The localities visited, or at any rate the Logroño Sierra, have probably not hitherto been systematically worked for the smaller Coleoptera. It may be noted, however, that Moncayo is the recorded habitat of *Cyrtonus cupreovirens* and *Otiorrhynchus caunicus*, and that certain species of *Dorcadion* have been noticed by Escalera from Neila, the

Sierra de la Demanda, and other places in the vicinity of Canales. A list of the species of Coleoptera and Hemiptera-Heteroptera, so far as at present identified, cannot fail therefore to be of interest, especially to show the affinity or otherwise of the fauna of the places visited with that of the nearest adjacent districts which are at all well known, viz. the Pyrenees, the Cantabrian Mountains, and the Sierra de Guadarrama. The forests of beech at Moncayo (those visited near Canales were too dry and not so productive), the pines at Canales (there were none at Moncayo), the mountain tops, the slopes, valleys, etc., had their special insects, the beech alone producing a considerable fauna. The beetles most in evidence on the higher mountains were the species of *Dorcadion*, each district having one or more local forms; two of these abounded in a restricted area on the summit of Moncayo, and another very similar insect was found on the Logroño Sierra. The species at Moncayo, where most abundant, occurred in company with swarms of the nymphs of a grasshopper, perhaps a natural result of one living above and the other below ground in places where grass was most abundant. When at rest, the beetles are rather conspicuous on uniformly-coloured bare earth, but when they were near or among tufts of grass, and amid a horde of jumping grasshoppers, the eye required some training to distinguish them. The likeness between the *Dorcadion* and the Orthopteron may of course have no further meaning than a similar facies induced by an identical habitat; still it may serve to protect the beetles during the short period of their existence in the perfect state. On Moncayo, too, *Coccinella 7-punctata* abounded to an incredible extent, the species being comparatively scarce lower down, swarming under every stone, and the presence there of certain other lowland forms, as *Cartallum ebulinum*, *Lebia cyanocephala*, *Aphodius carpetanus*, etc., would suggest that these insects were migrating or had been carried there by the terrific winds at times prevalent in the district. Other species met with on the higher ground, either at Moncayo or Canales, were *Chlænius dives*, *Limonius nigripes*, various *Corymbites*, *Zabrus*, *Cymindis*, *Helicopathes*, *Timarcha*, *Cyrtonus*, *Pterostichus*, and *Byrrhus*, a *Rhytirrhinus*, a *Crypticus*, *Aphodius scrutator*, and many others. Near the lingering patches of snow, *Carabus helluo* and *C. purpurascens*, *Tachypus cyanicornis*, *Leistus montanus*, *Otiorrhynchus caunicus*, *Bryoporus*

rugipennis, etc., were found; and on the snow itself two *Omophli* in plenty, *Chrysomela gaubili*, *Corymbites*, *Rhizotrogus*, *Aphodius*, *Byrrhus*, and others. On the slopes of Moncayo, between 5000 and 6000 feet, the heath, while in flower, as already mentioned, attracted a vast number of minute Coleoptera, amongst others a tiny *Centhorrhynchus* (in the greatest profusion), *Lebia cyanocephala* and *L. trimaculata*, *Gynandrophthalma concolor*, and divers *Anthobium*, *Meligethes*, *Brachypterus*, *Dasytes*, *Danacæa*, *Antholinus*, *Hypebæus*, *Phyllotreta*, *Cryptocephalus*, *Pachybrachys*, *Apion*, small *Telephorids*, etc., many of these insects occurring also on *Genista*, but more sparingly. In the hollows hereabouts, near the sources of the small streams, there is an abundant growth of *Aconitum napellus*, and from some Phytophagous larvæ found on this plant, Dr. Chapman subsequently bred *Galeruca laticollis*. Lower down, just above and among the beeches, the Umbelliferæ attracted *Semiadalia* 11-*notata* in great abundance (a species far outnumbering *Coccinella* 7-*punctata* at this level), *Leptura scutellata* (including a pallid variety), *Cerambyx scopolii*, *Clytus arietis* (including the var. *bourdilloni*), *Phytœcia affinis* and others of the genus, *Agapanthia cardui*, *Clytanthus figuratus*, *Trichius gallicus*, *Eryx ater*, *Mordella aculeata*, *Haplocnemus*, *Lebia*, etc. In the beech woods themselves, *Lebia cyanocephala* was almost the commonest beetle, abounding under the dry loose bark of standing trees, living in company with *Cymindis discoidea* (in plenty), *Helops caraboides*, *Quedius crassus*, and swarms of earwigs, the latter much resembling the *Cymindis* at first sight. This last-mentioned insect also occurred very sparingly under stones on the high ground, and I had previously taken it in the same way in the Sierra Nevada, but here in the beech forest it seemed to have acquired the subcortical habits of a *Dromius*. On old decaying standing beeches the beautiful *Rosalia alpina* was often to be seen running about on the bark in the sunshine, sometimes coming within reach, and one or two trees were riddled with their burrows. It is probable that this insect is often devoured by birds, one mutilated but still lively specimen taken having evidently dropped from a bird's beak. The bark of these trees, or the fungoid growth thereon, harboured a great variety of Coleoptera, as *Platycerus spinifer* (a species usually found amongst the dead stems of *Genista*, in which it is said to breed), *Sinodendron*, *Lygistopterus sanguineus*, *Læmophlœus monilis* and

L. ater, *Ditoma*, *Cerylon*, *Diplocælus fagi*, *Litargus bifasciatus*, various red Elaters, *Tenebroides mauritanicus*, *Cælometopus*, *Abdera quadrifasciata*, *Hallomenus humeralis*, *Orchesia micans*, *Scraptia fuscula*, *Engis*, *Ennearthron*, etc. The old beech stumps attracted *Tomoxia*, and the fresh-cut logs and stumps *Xyleborus dispar*, *Melasis*, *Læmophlæus testaceus* (in abundance), an *Agrilus* (specimens of which were dug out of the solid wood), etc. At Canales most of the old beeches found were too dry to produce much beyond *Thymalus*, *Tillus elongatus*, *Brontes planatus*, *Leptura scutellata*, and the like, though they were riddled with the burrows of *Dorcus*. The pines, however, furnished a considerable number of species, as *Rhagium indagator*, *Pogonochærus fasciculatus*, *Pissodes pini*, three species of *Magdalis*, *Rhinomacer*, four species of *Tomicus*, *Myelophilus minor*, *Hylastes palliatus*, *Corticeus pini*, *Platysoma oblongum*, two species of *Plegaderus*, two of *Paromalus*, *Tachyta*, *Placusa*, etc. Under pine chips and logs on damp ground were found *Cælometopus* (in plenty), two *Carabi*, *Steropus*, *Pterostichus*, *Platyderus*, *Scaphidium*, a small elongate *Anemadus*, and others.

On the higher slopes at Canales or Moncayo various interesting forms were beaten from oak bushes, as *Rhynchites sericeus* and others of the genus, *Cerambyx scopolii*, *Rhopalopus perforatus*, and divers *Strophosomus*, *Phyllobius*, *Polydrusus*, *Balaninus*, *Cryptocephalus*, *Pachybrachys*, *Clythra*, etc. *Henicopus* and *Hymenoplia*, as usual, swarmed on grass-stems on the hill-sides and in the valleys, and a *Chasmatopterus* flew in abundance over the grass; while in dry, arid places the sluggish *Capnodis tenebricosa* could be taken easily from the lichen-covered blackthorn bushes, and also, but rarely, *Ptosima* 11-*maculata*. Horse-dung in dry places at Canales sometimes harboured the local *Aphodius carpetanus* in abundance (a species also seen almost in the city of Burgos and on the summit of Moncayo), and the usual *Gymnopleurus*, *Ateuchus*, *Onthophagus*, *Hister sinuatus*, etc.

A very interesting new moth, *Pyropsyche moncaunella*, Chapm., was found by Dr. Chapman and myself on the rocks on the upper part of Moncayo. This species has already been figured and described in the Entomologist's Record (xv, pp. 324–330; xvi, pp. 67, 68, t. 2). His figures of the insect are reproduced at the end of this paper, on Plate XVI. A rough map of our route is given

by Dr. Chapman in his paper on *Heterogynis* in the present volume of our Transactions, on Plate XIII, and also a view of Canales, on Plate XIV.

At Guéthary, in the Basses-Pyrenees, where we broke the journey both going and returning, a few interesting beetles were found, as *Aëpys robini*, *Actocharis marina*, *Eubria palustris*, *Aphanisticus emarginatus* (in profusion by sweeping rushes in a marshy place), etc.

The following is a list of the Coleoptera and Hemiptera-Heteroptera so far as at present identified :—

[Monc. = Moncayo ; Can. = Canales ; Tar. = Tarazona ; Burg. = Burgos.]

Coleoptera.

Cicindela sylvatica, Linn., and *C. campestris*, Linn., Can. *Carabus purpurascens*, Fabr., summit of Moncayo; *C. helluo*, Dej., Monc., Can.; *C. nemoralis*, Müll., var., under pine-chips in the Pinares between Canales and Huerta. *Leistus montanus*, Steph., one specimen near the summit of Moncayo. *Notiophilus aquaticus*, Linn., Can., Monc. *Tachypus cyanicornis*, Pand., under stones, near the snow, Monc. *Bembidium laterale*, De G., Monc.; *B. lampros*, Herbst, Can.; *B. quadriguttatum*, Fabr., Soria, Tar.; *B. quadrimaculatum*, Linn., Soria; *B. hispanicum*, Dej., banks of the Duero, Soria; *B. fasciolatum*, Duft., with the preceding; *B. nitidulum*, Marsh., Can.; *B. minimum*, Fabr., Monc.; *B. normannum*, Dej., Soria. *Tachyta nana*, Gyll., Can., under pine-bark. *Platynus viridicupreus*, Goeze, Soria. *Calathus punctipennis*, Germ., *C. fuscus*, Linn., and *C. piceus*, Marsh., Can. *Pristonychus terricola*, Herbst, commonly at Canales, in the mouth of a cave. *Pœcilus dimidiatus*, Oliv., *P. cœrulescens*, Linn., and *P. crenulatus*, Dej., Can. *Steropus lacordairei*, Putz., common under stones, Can.; *S. globosus*, Fabr., Can., Monc. *Haptoderus nemoralis*, Graells, not rare, under large stones in the beech forest, Monc. *Platyderus montanellus*, Graells ?, Can.; *P. ruficollis*, Marsh., var. ?, Monc. *Zabrus neglectus*, Schaum, Can., Monc., not rare, under stones. *Amara curynota*, Panz., Monc; *A. equestris*, Duft., var. *zabroides*, Dej., under stones, Can.; *A. eximia*, Dej., Can. *Acinopus picipes*, Oliv., Can. *Ditomus fulvipes*, Dej., Can. *Aristus capito*, Dej., Burg., Can., on the roads towards evening; *A. sphæroccphalus*, Oliv., Can., *Ophonus sabulicola*, Panz., and *O. azureus*, Fabr., Can. *Harpalus honestus*, Duft., *H. attenuatus*, Steph., *H. rubripes*, Duft.,

H. scrripes, Quens., *H. picipennis*, Duft., etc., Can. *Chlænius velutinus*, Duft., on the banks of the Duero, Soria, and near the source of a small stream, Monc.; *C. vestitus*, Payk., Soria; *C. dives*, Dej., sparingly, on the mountains, Can. *Lebia cyanocephala*, Linn., in the greatest profusion, under loose bark of beech trees, on heath, broom, etc., Monc.; *L. rufipes*, Dej., Can.; *L. trimaculata*, Vill., on herbage, etc., Monc. *Metabletus obscuroguttatus*, Duft., Monc. *Dromius quadrisignatus*, Dej., under beech-bark, Monc. *Cymindis variolosa*, Fabr., under stones, Monc., Can.; *C. discoidea*, Dej., in plenty under loose dry bark of old beech trees, Monc.; *C. scapularis*, Schaum, Can.; *C. ruficeps*, Chaud., Monc., Can.; and others of the genus.

Oxypoda platyptera, Fairm., summit of Moncayo, one specimen. *Aleochara discipennis*, Rey, Monc.; *A. clavicornis*, Redt., Can. *Atheta nigritula*, Grav., in plenty, in bones, etc., placed in the cave, Can. *Thectura cuspidata*, Er., under beech-bark, Monc. *Placusa complanata*, Er., in abundance under pine-bark, Can. *Tachyusa balteata*, Er., *T. coarctata*, Er., and *T. constricta*, Er., banks of the Duero, Soria. *Bryoporus rugipennis*, Pand., summit of Moncayo, one specimen in moss. *Myctoporus brunneus*, Marsh., Can. *Ischnopoda umbratica*, Er., with the preceding. *Autalia impressa*, Oliv., Monc. *Quedius crassus*, Fairm., sparingly under loose bark of standing beeches, Monc.; *Q. mesomelinus*, Marsh., *Q. fuliginosus*, Grav., Can., Monc. *Leistotrophus murinus*, Linn., Can. *Ocypus ophthalmicus*, Scop., under stones, Monc., Can.; *O. brunnipes*, Fabr., Monc. *Philonthus atratus*, Grav., *P. ebeninus*, Grav., *P. quisquiliarius*, Gyll., banks of the Duero, Soria; *P. splendidulus*, Grav., under bark, Can. *Othius læviusculus*, Steph., Monc. *Xantholinus tricolor*, Fabr., Monc.; *X. fulgidus*, Fabr., Soria, Tar. *Lathrobium multipunctum*, Grav., Tar. *Pæderus ruficollis*, Fabr., Soria. *Platystethus cornutus*, Grav., and *P. nitens*, Sahlb., Tar. *Bledius fracticornis*, Payk., Tar., Soria. *Omalium florale*, Payk., Monc. *Anthobium adustum*, Kies., Monc., Can.; *A. hispanicum*, Bris., Can., in plenty on flowers; *A. angustum*, Kies., Monc.

Anemadus transversostriatus, Murr., Can., rarely, under pine-chips. *Silpha nigrita*, Creutz., *S. undata*, Müll., and *S. rugosa*, Linn., Can. *Phosphuga atrata*, Linn., Monc. *Scaphidium quadrimaculatum*, Oliv., Can. *Scaphisoma agaricinum*, Linn., Can. *Olibrus bisignatus*, Mén., Can., Monc., Soria; *O. biplagiatus*, Guill., Can. *Engis humeralis*, Fabr., Monc., in rotten beech. *Atomaria fuscipes*, Gyll.,

Monc.; *A. analis*, Er., Monc., Burg. *Litargus bifasciatus*, Fabr., Monc., common, under beech-bark. *Diphyllus lunatus*, Fabr., Monc., with the preceding. *Brachypterus cinereus*, Heer, Monc. *Meligethes brassicæ*, Scop., var. *australis*, Küst., Monc., in abundance on *Erica* flowers high up on the mountain slope; *M. tristis*, Sturm, Monc., Can.; *M. fuscus*, Oliv., and others of the genus, Monc. *Thalycra fervida*, Oliv., Monc. *Thymalus limbatus*, Fabr., Can., under dry beech-bark. *Tenebroides mauritanicus*, Linn., Monc., not rare under beech-bark. *Rhizophagus bipustulatus*, Fabr., Monc. *Ditoma crenata*, Fabr., Monc., under beech-bark. *Cerylon histeroides*, Fabr., and *C. ferrugineum*, Steph., Monc., with the preceding. *Brontes planatus*, Linn., Can., under beech-bark. *Læmophlœus testaceus*, Fabr., in abundance under bark of recently felled beeches; *L. monilis*, Fabr., and *L. ater*, Oliv., rarely, under beech-bark *Airaphilus carpetanus*, Heyd., Monc. *Dermestes murinus* Linn., Can. *Byrrhus depilis*, Graells, Can.; *B. dorsalis* Fabr., Can., Monc.; *B. fasciatus*, Fabr., Monc. *Cytilus sericeus*, Forst., Monc. *Pedilophorus auratus*, Duft.?, summit of Monc., rarely, under stones, mostly found dead and broken. *Paromalus flavicornis*, Herbst, and *P. parallelopipedus*, Herbst, Can. *Platysoma oblongum*, Fabr., Can., in abundance under sappy pine-bark; *P. frontale*, Payk., Can., two specimens, under stones. *Hister quadrimaculatus*, Linn., var. *gagates*, Ill., *H. amplicollis*, Ill., *H. fimetarius*, Herbst, *H. bissexstriatus*, Fabr., Can., Monc., more or less common in dung. *Plegaderus sanatus*, Truqui, rarely, and *P. saucius*, Er., commonly, under pine-bark, Can. *Saprinus lautus*, Er., Can., two specimens, under stones. *Parnus lutulentus*, Er., Can.

Lucanus cervus, Linn., Can., Anguiano. *Dorcus parallelopipedus*, Linn., Monc., in beech. *Platycerus spinifer*, Schauf., Can., Monc., very rarely, in beech. *Sinodendron cylindricum*, Linn., Can., Monc., in beech. *Scarabæus laticollis*, Linn., Monc. *Gymnopleurus flagellatus*, Fabr., Can. *Sisyphus schæfferi*, Linn., Can. *Onthophagus lemur*, Fabr., Can.; *O. schreberi*, Linn., Can., Burg.; *O. verticicornis*, Laich., Can.; *O. furcatus*, Fabr., Can., Burg. *Aphodius scrutator*, Herbst, Can., a few specimens high up on the mountains; *A. erraticus*, Linn., *A. fossor*, Linn., *A. hæmorrhoidalis*, Linn., *A. scybalarius*, Fabr., *A. sordidus*, Fabr., *A. bigutattus*, Germ., *A. luridus*, Fabr., *A. scrofa*, Fabr., *A. obscurus*, Fabr., and others, Can.; *A. carpetanus*, Graells, in abundance

in horse-dung in dry places, Can., and very sparingly at Moncayo, one example occurring on the summit, also found singly close to Burgos. *Ammœcius frigidus*, Bris., high up on Moncayo. *Pleurophorus cæsus*, Panz., common on the wing along the roadsides towards evening, Burg. *Geotrupes vernalis*, Linn., Monc., Can. *Phyllognathus silenus*, Fabr., Tar., found dead on the road. *Rhizotrogus pygialis*, Muls., Soria; *R. solstitialis*, Linn., var. *pineticola*, Graells, Monc.; *R. ater*, Fabr., Can.; *R. lusitanicus*, Gyll., Can.; *R. marginipes*, Muls., Can. *Triodonta aquila*, Lap., Can. *Seriea mutata*, Gyll., Soria. *Chasmatopterus villosulus*, Ill., Can., Monc., males as usual in abundance on the wing, females sparingly at rest on flowers. *Hymenoplia rugulosa*, Muls., Can., Monc., common on grass stems, etc. *Anisoplia bætica*, Er., Can. *Hoplia philanthus*, Füssl., Monc., Can. *Cetonia floricola*, Herbst, *C. oblonga*, Gory, and *C. morio*, Fabr., Tar., Can. *Trichius fasciatus*, Linn., Can.; *T. gallicus*, Heer, in plenty on Umbelliferæ, in the beech forest, Monc.

Capnodis tenebricosa, Herbst, Can., Monc., not rare on blackthorn-bushes in dry, hot places, the grey markings on the prothorax exactly resembling the patches of lichen on the stems of these plants. *Ptosima 11-maculata*, Herbst, Can., one specimen with the preceding. *Agrilus viridis*, Linn., var. *nocivus*, Ratz., Monc., dug out of the hard wood of beech; and others of the genus. *Acmæodera flavofasciata*, Pill., Monc., Can. *Anthaxia funerala*, Ill., *A. millefolii*, Fabr., and *A. confusa*, Lap., Monc., Can.

Elater ferrugatus, Lac., Monc., Can.; *E. elongatulus*, Fabr., Can.; *E. cinnabarinus*, Esch. ?, and *E. croceatus*, Lac., Monc., in beech, rarely. *Melanotus tenebrosus*, Er., Can. *Limonius nigripes*, Gyll., on the mountains, Can.; *L. minutus*, Linn., Monc. *Cardiophorus signatus*, Oliv., *C. equiseti*, Herbst, Can., commonly. *Athous lateralis*, Bris., and others of the genus, Monc., Can. *Betarmon picipennis*, Bach, Monc., Can. *Corymbites cupreus*, Fabr. ?, Can.; *C. latus*, Fabr., commonly on the mountains, Can.; *C. æneus*, Linn., dark var., summit of Moncayo, not uncommon; *C. holosericeus*, Oliv., Monc., Can. *Helodes minuta*, Linn., Monc.

Lygistopterus sanguineus, Linn., Monc., rarely, in old beech trees. *Lampyris noctiluca*, Linn., Monc., at light. *Telephorus abdominalis*, Fabr., Monc.; *T. lividus*, Linn., *T. bicolor*, Herbst, and many others, Monc., Can. *Rhagonycha genistæ*, Kies., Monc.; *R. hesperica*, Baudi, Can., Monc.

Malthinus and *Malthodes*, various spp., Monc., Can. *Hypebæus alicianus*, Duv.,* Monc., Can. *Malachius viridis*, Fabr., Monc., Can. *Antholinus amictus*, Er., Monc., common on heath. *Charopus concolor*, Fabr., Can. *Henicopus hcydeni*, Kies.?, Monc., Can., males in profusion, females sparingly, as usual, and one or two other species of the genus. *Dasytes subæneus*, Schönh., *D. ærosus*, Kies., Monc.; *D. plumbeus*, Müll., Can., and others. *Psilothrix cyaneus*, Oliv., Monc., Can. *Dolichosoma lineare*, Rossi, Can. *Haplocnemus albipilis*, Kies., Monc., common on flowers, and others of the genus. *Danacæa atripes*, Graells, Monc.; *D. reyi*, Proch., Can., a few specimens, and others of the genus. *Tillus elongatus*, Linn., Can., on a dead beech. *Thanasimus formicarius*, Linn., Can., on pine logs. *Trichodes apiarius*, Linn., *T. leucopsideus*, Oliv., and *T. ammios*, Fabr., Can., not rare, on flowers. *Priobium castaneum*, Fabr., Monc. *Lasioderma lævc*, Ill., Soria; *L. hæmorrhoidale*, Ill., Can., on flowers. *Xyletinus ater*, Panz., *X. laticollis*, Duft., etc., Can., Monc., on flowers. *Sphindus dubius*, Gyll., Can., in fungoid growth on beech. *Cis boleti*, Fabr., and *C. setiger*, Mell., Monc. *Ennearthron affine*, Mell., Monc., in fungus on beech.

Stenosis hispanica, Sol., under stones, Monc. *Asida goudoti*, Sol., and *A. sericea*, Oliv., Can., not rare under stones. *Blaps gigas*, Linn., *Scaurus punctatus*, Herbst, and *Akis elegans*, Charp., more or less abundant in the outskirts of Tarazona. *Dendarus castilianus*, Pioch., under stones, Monc. *Heliopathes perroudi*, Muls., and others of the genus, more or less abundantly, Monc. *Olocrates abbreviatus*, Oliv., Can. *Crypticus quisquilius*, Linn., var. *pyrenæus*, Baudi,† commonly on the summit of Moncayo; *C. zophosoides*, Heyd., Can. *Corticeus pini*, Panz., Can., under pine-bark. *Cælometopus clypeatus*, Germ., in plenty under pine-chips, Can., and very rarely at Moncayo. *Helops caraboides*, Panz., in profusion under loose beech-bark, Monc.; *H. laticollis*, Küst., Monc.; *H. coriaceus*, Küst., Monc. *Eryx ater*, Fabr., Monc., one specimen. *Gonodera luperus*, Herbst, Can. *Omophlus lepturoides*, Fabr., in abundance, and *O. picipes*, Fabr., sparingly, on the mountains, Can., Monc., on the wing,

* Omitted from my Bejar list last year. I have also taken it at Vernet, Pyrén.-or.

† These specimens are considerably smaller than those I have taken at Mont Louis in the Pyrenees.

and by beating pines, etc., and found on nearly all the patches of snow. *Isomira murina*, Linn., in abundance, on flowers, Monc.; *I. antennata*, Panz., Can. *Lagria grenieri*, Bris., in plenty on *Genista*, Monc., Can.; *L. hirta*, Linn., Monc. *Hallomenus humeralis*, Panz., *Orchesia micans*, Panz., and *Abdera quadrifasciata*, Curt., in numbers, in rotten beech, Monc. *Scraptia dubia*, Oliv., Can., Monc., commonly on oak, even in very dry places, and always extremely active; *S. fuscula*, Müll., one specimen, Monc., in rotten beech. *Rhinosimus ruficollis*, Linn., and *R. planirostris*, Fabr., Monc., under beech-bark. *Anthicus tenellus*, Laf., Soria; *A. tristis*, Schmidt, Can. *Tomoxia biguttata*, Gyll., on beech stumps, Monc. *Mordella aculeata*, Linn., Monc., Can., Soria, common on flowers. *Mordellistena episternalis*, Muls., and *M. brevicauda*, Boh., Can.; *M. pumila*, Gyll., and *M. micans*, Germ., Monc., Can.; *M. parvula*, Gyll., Monc. *Silaria trifasciata*, Chevr., and *S. quadrimaculata*, Gyll., Monc., Can. *Anaspis subtestacea*, Steph., and others of the genus, Monc., Can. *Cerocoma schreberi*, Fabr., on flowers, Can. *Meloë majalis*, Linn., and *M. brevicollis*, Panz., Can. *Zonabris quadripunctata*, Linn., *Z. variabilis*, Pall., *Z. hieracii*, Graells, *Z. dejeani*, Gyll., *Z. fuesslini*, Panz., and others of the genus, Can., Monc., Soria. *Coryna billbergi*, Gyll., Monc., Can. *Œdemera podagrariæ*, Linn., *Œ. flavipes*, Fabr., *Œ. subulata*, Oliv., *Œ. nobilis*, Scop., and *Œ. lurida*, Marsh., Can., Monc. *Asclera cærulea*, Linn., Monc., in beech.

Otiorrhynchus caunicus, Perez (*amputatus*, Chevr.), sparingly under stones, moss, etc., at or near the summit of Moncayo; *O. ovatus*, Linn., Monc. *Phyllobius tuberculifer*, Chevr., Can., Monc., in plenty, by beating oak, etc. *Polydrusus setifrons*, Duv., Monc., Can.; *P. cervinus*, Linn., Monc.; *P. impressifrons*, Gyll., Can.; *P. confluens*, Steph., Can. *Sciaphilus carinula*, Oliv., Can., on *Genista*. *Strophosomus crinaceus*, Chevr., Monc., Can.; *S. coryli*, Fabr., Monc.; *S. affinis*, Stierl.?, Can., not uncommon; *S. picticollis*, Seidl.?, Monc., Can.; *S. faber*, Herbst, Monc., and others of the genus. *Brachyderes lusiticanus*, Fabr., Can., on pines; *B. brucki*, Tourn.?, Can., on oak. *Sitones flavescens*, Marsh., var. *cinnamomeus*, All., Monc.; *S. crinitus*, Herbst, Can. *Cathormiocerus lapidicola*, Chevr., Can., and *C. gracilis*, Seidl., Monc., both under stones, on the mountains. *Brachycerus pradieri*, Fairm., Can. *Cleonus pedestris*, Poda, *C. cinereus*, Schr., and *C. sulcirostris*, Linn., Can.; *C.*

obliquus, Fabr., Monc. *Lixus cardui*, Oliv., Can. *Larinus latus*, Herbst, Soria; *L. jaccæ*, Fabr., Can., and others of the genus. *Rhinocyllus latirostris*, Latr., Can. *Rhytirrhinus stableaui*, Fairm. ?, rarely, under stones, on the summit of Moncayo, a species difficult to obtain in good condition, the metallic scales being easily abraded. *Anisorrhynchus bajulus*, Oliv., Can. *Pissodes notatus*, Fabr., Can., on pines. *Pachytychius sparsutus*, Oliv., on *Genista*, and *P. hæmatocephalus*, Gyll., Can.; *P. scabricollis*, Ros., Soria. *Smicronyx* sp., Can. *Cossonus linearis*, Fabr., Burgos, on the wing towards evening. *Brachytemnus porcatus*, Germ., Can., in abundance under bark of dead pines. *Cœliodes ruber*, Marsh., *C. ilicis*, Bed., and *C. cardui*, Herbst, Monc. *Ceuthorrhynchus macula-alba*, Herbst, *C. geographicus*, Goeze, *C. marginatus*, Payk., *C. cyanipennis*, Germ., Can.; *C. nanus*, Gyll., var., in the greatest profusion on *Erica*, while in flower. *Ceuthorrhynchidius horridus*, Panz., Monc.; *C. urens*, Gyll., Can.; *C. troglodytes*, Fabr., var. ?, a small form approaching *C. frontalis*, Bris., Can. *Balaninus pellitus*, Boh., and *B. villosus*, Fabr., Can., on oak. *Anthonomus rubi*, Herbst, Monc. *Tychius quinquepunctatus*, Linn., Can., and others of the genus. *Sibinia primita*, Herbst, Monc. *Orchestes pilosus*, Fabr., *O. quercus*, Linn., and *O. fagi*, Linn., Monc., Can. *Rhamphus pulicarius*, Herbst, Can. *Mecinus pyraster*, Herbst, Can. *Miarus campanulæ*, Linn., Can. *Gymnetron noctis*, Herbst, Can. *Nanophyes niger*, Waltl, Monc., Can., sparingly on heath. *Magdalis memnonia*, Gyll., *M. phlegmatica*, Herbst, and *M. violacea*, Linn., on pines, Can. *Apion fuscirostre*, Fabr., and *A. squamigerum*, Duv., on *Genista*, *A. wenckeri*, Bris., on *Cistus*, *A. flavimanum*, Gyll., *A. atomarium*, Kirby, *A. urticarium*, Herbst, *A. vorax*, Herbst, etc., Monc.; *A. sulcifrons*, Herbst, Soria; *A. craccæ*, Linn., *A. æthiops*, Herbst, etc., Can. *Rhynchites sericeus*, Herbst, Can., Monc., very sparingly on oak, on the mountain sides. *R. æneovirens*, Marsh., *R. pubescens*, Fabr., Can.; *R. olivaceus*, Gyll., Monc. *Attelabus curculionoides*, Linn., Monc., Can., abundant everywhere on young oaks. *Rhinomacer attelaboides*, Fabr., Can., one specimen on pine. *Platyrrhinus latirostris*, Fabr., Monc., in fungoid growth on beech. *Brachytarsus fasciatus*, Forst., Monc. *Urodon suturalis*, Fabr., Can.; *U. rufipes*, Oliv., Can., Soria. *Bruchus* spp., undetermined, Monc., Can. *Hylastes palliatus*, Gyll., common under pine-bark, Can. *Hylastinus trifolii*, Müll., in dead stems of *Genista*, Can. *Myelophilus minor*,

Hart., in felled pines, Can. *Phlœophthorus rhododactylus*, Marsh., in dead stems of *Genista*, Can. *Pityogenes bidentatus*, Herbst, Can. *Tomicus sexdentatus*, Boern., abundant, *T. laricis*, Fabr., *T. acuminatus*, Gyll., and *T. longicollis*, Gyll., in felled pines, Can. *Taphrorychus bicolor*, Herbst, Monc. *Xyleborus dispar*, Fabr., Monc., not uncommonly in freshly-cut beech stumps; the sexes in about equal numbers, the males usually two or three together about the entrances of the burrows of the females, the latter occasionally on the bark, but mostly in the burrows, from which they were not easily extracted; *X. monographus*, Fabr., Monc. *Rhagium indagator*, Fabr., Can., on pines. *Toxotus meridianus*, Linn., Can. *Leptura scutellata*, Fabr., Monc., Can., common on Umbelliferæ in beech woods, including a pallid variety (*ochracea*, Faust?); *L. fulva*, De G., Monc.; *L. livida*, Fabr., and *L. ecrambyciformis*, Schr., Monc., Can.; *L. hybrida*, Rey, Monc., common on Umbelliferæ. *Acmæops collaris*, Linn., Can. *Strangalia maculata*, Poda, Monc., Can.; *S. attenuata*, Linn., on *Cistus* flowers, Monc.; *S. bifasciata*, Müll., Can.; *S. nigra*, Linn., Can. *Allosterna tabacicolor*, De G., Monc. *Grammoptera ruficornis*, Fabr., Monc. *Cartallum ebulinum*, Linn., one specimen on the summit of Moncayo. *Dilus fugax*, Oliv., Can. *Cerambyx scopolii*, Füssl., on Umbelliferæ, and also beaten from oak, Monc., Can. *Rhopalopus femoratus*, Linn., Monc., Can., rarely, by beating oak, etc. *Rosalia alpina*, Linn., Monc., males not rare on trunks of large decaying beeches, and occasionally found dead in old burrows in the trees; one living mutilated example found had evidently been dropped by a bird: a most beautiful insect alive. *Xylotrechus arvicola*, Oliv., Can., Monc. *Clytus arietis*, Linn., and its var. *bourdilloni*, Muls., on flowers, Monc. *Clytanthus trifasciatus*, Fabr., Soria; *C. figuratus*, Scop., Monc., not rare on Umbelliferæ. *Dorcadion tercolense*, Esc., var. *albarium*, Esc., and *D. seguntianum*, Esc., var., abundant in a restricted place on the summit of Moncayo, both varying in the colour of the vestiture; an almost bare form of the female of *D. seguntianum* occurred, as in some others of the genus. *D. neilense*, Esc., not rare on the summit of the Sierra de la Demanda, near Canales; *D. circumcinctum*, Chevr., Burgos, on the road to the Cartujar; *D. escalerai*, Lauff., rarely on Moncayo, where it had previously been taken by Father Navas; *D. spinolæ*, Dalm., Burgos, on the

banks of the irrigation ditches amongst the trees planted on the road to the Cartujar, also singly at Moncayo. *Pogonochærus fasciculatus*, De G., Can., on pines. *Agapanthia asphodeli*, Latr., *A. dahli*, Richt., and *A. cardui*, Linn., Can.; *A. villosoviridescens*, De G., Monc. *Phytœcia cœrulescens*, Scop.; *P. pustulata*, Schr., and *P. virgula*, Charp., Can.; *P. affinis*, Harr., Monc.

Donacia discolor, Panz., Monc.; *D. consimilis*, Schr., Can. *Tituboea sexmaculata*, Fabr., Soria. *Labidostomis lusitanica*, Germ., Can., Tar. *Lachnæa sexpunctata*, Scop., Monc., Can.; *L. pubescens*, Duf., Monc., *L. tristigma*, Lac., Can., and others of the genus. *Clythra læviuscula*, Ratz., Monc., Soria. *Gynandrophthalma concolor*, Fabr., Monc., Can., common on *Genista*, *Erica*, etc. *Coptocephala scopolina*, Linn., Monc., Soria. *Cryptocephalus cynaræ*, Suffr., Monc.; *C. lusitanicus*, Suffr., *C. bipunctatus*, Linn., *C. violaceus*, Laich., *C. mystacatus*, Suffr., Monc., Can.; *C. rugicollis*, Oliv., Burg., Can., common on flowers, etc., very variable; *C. crassus*, Oliv., *C. capucinus*, Suffr., *C. pygmæus*, Fabr., Soria; *C. koyi*, Suffr., *C. moræi*, Linn., *C. schäfferi*, Schr., very rarely on oak, *C. quadripunctatus*, Oliv., *C. globicollis*, Suffr., *C. aureolus*, Suffr., *C. hydrochœridis*, Linn., *C. pexicollis*, Suffr., *C. infirmior*, Kr., Can. *Pachybrachys viridissimus*, Suffr., Can.; *P. suffriani*, Schauf.?, Monc. *Timarcha rugipennis*, Perez, Can., Monc., and others of the genus. *Cyrtonus cupreovirens*, Perez, not rare, under stones, summit of Moncayo. *Chrysomela gaubili*, Luc., Can., one specimen on the snow; *C. americana*, Linn., Monc.; *C. analis*, Linn., Can., and others of the genus. *Phytodecta variabilis*, Oliv., Can., on *Genista*; *P. olivacea*, Forst., Monc. *Plagiodera versicolora*, Laich., Tar., common. *Malacosoma lusitanicum*, Linn., Can. *Luperus nigrofasciatus*, Goeze, common on *Genista*, *L. lividus*, Joann., on pines, *L. flavipes*, Linn., and *L. niger*, Goeze, Can. *Galeruca tanaceti*, Linn., and *G. laticollis*, Sahlb., the latter bred from larvæ found on *Aconitum napellus*, Monc., and *G. interrupta*, Oliv., on the mountains, Can., two specimens. *Lochmæa suturalis*, Thoms., Monc., on heath. *Galerucella lutcola*, Müll., on elm, Tar. *Crepidodera transversa*, Marsh., Monc. *Mantura chrysanthemi*, Koch, Can. *Psylliodes chalcomera*, Ill., Can., *P. luteola*, Müll., Monc., and others of the genus. *Aphthona lævigata*, Fabr., in abundance on *Euphorbia*, Tar. *Phyllotreta* sp., common on flowers of *Erica*, Monc. *Longitarsus*, *Apteropeda*, etc.,

undetermined. *Hispa atra*, Linn., Can.; *H. testacea*, Linn., Monc., on *Cistus*.

Subcoccinella 22-*punctata*, Linn., Can. *Semiadalia* 11-*notata*, Schn., in great abundance on flowers of Umbelliferæ, also rarely on the summit, Monc. *Adalia mutabilis*, Scriba, Monc., Tar. *Coccinella* 7-*punctata*, Linn., in vast numbers under stones all over the summit, and sparingly lower down on flowers, etc., Monc.; varieties occurred with the spots (the common scutellar one excepted) very minute; *C.* 14-*pustulata*, Linn., Monc., Soria. *Halyzia* 18-*guttata*, Linn., Can. *Exochomus* 4-*pustulatus*, Linn., Can., Monc. *Micraspis* 16-*punctata*, Linn., Soria. *Platynaspis luteorubra*, Goeze, Can. *Scymnus* spp. undetermined.

Hemiptera-Heteroptera.

Eurygaster maura, Linn., Soria; *E. nigrocucullata*, Goeze, Can. *Graphosoma lineatum*, Linn., Monc. *Geotomus punctulatus*, Costa, Can. *Gnathoconus picipes*, Fall., Monc. *Ochetostethus nanus*, H.-S., Can. *Sciocoris macrocephalus*, Fieb., and *S.* sp. n. ?, Monc. *Ælia rostrata*, Poh., Soria, Can. *Neottiglossa flavomarginata*, Luc., Can.; *N. inflexa*, Wolff, Monc.; *N. leporina*, H.-S., Can. *Staria lunata*, Hahn, Can. *Peribalus vernalis*, Wolff, Monc., Soria. *Carpocoris purpuripennis*, De G., Can. *Dolycoris baccarum*, Linn., Monc. *Chlorochroa juniperina*, Linn., Monc. *Palomena prasina*, Pod., Monc. *Pentatoma rufipes*, Linn., Monc. *Eurydema oleraceum*, Linn., Can. *Phyllomorpha laciniata*, Vill., Can. *Centrocoris spiniger*, Fabr., Can. *Syromastes marginatus*, Linn., Monc. *Verlusia quadrata*, Fabr., Can.; *V. sulcicornis*, Fabr., Monc. *Loxocnemis dentator*, Fabr., Can. *Coreus affinis*, H.-S., Soria, Can. *Stenocephalus agilis*, Scop., Monc. *Camptopus lateralis*, Ger., Can. *Therapha hyoscyami*, Linn., Can., Monc. *Corizus crassicornis*, Linn., Can. *C. parumpunctatus*, Schil., Monc. *Maccevethus lincola*, Fabr., Can. *Berytus distinguendus*, Ferr. ?, Soria. *Lygæus equestris*, Linn., Monc., Can.; *L. saxatilis*, Scop., Can.; *L. pandurus*, Scop., Monc., Tar.; *L. albomaculatus*, Goeze, Can.; *L. superbus*, Poll., Monc., Can., Soria. *Lygæosoma reticulatum*, H.-S., Can. *Cymus glandicolor*, Hahn, Monc. *Ischnorhynchus geminatus*, Fieb., Monc. *Heterogaster calariæ*, Fourc., Can., common on herbage; *H. artemisiæ*, Schill., Can., Monc., Soria;

H. affinis, H.-S., Can.; *H. urticæ*, Fabr., Can. *Microplax interrupta*, Fieb., and *M. albofasciata*, Costa, Can. *Metopoplax ditomoides*, Costa, Can. *Macroplax fasciata*, H.-S., Can. *Tropistethus holosericeus*, Scholtz, Can, *Macrodema micropterum*, Curt., Monc. *Pterotmetus staphylinoides*, Burm., Can. *Plinthisus longicollis*, Fieb., Monc. *Aphanus alboacuminatus*, Goeze, Can.; *A. pini*, Linn., Monc. *Microtoma atrata*, Goeze, Can. *Trapezonotus ullrichi*, Fieb., Can., in abundance towards evening, on Umbelliferous flowers. *Emblethis verbasci*, Fabr., and *E. angustus*, Mont., Can. *Phyllontochcila angustata*, H.-S., Can. *Copium teucrii*, Host., Can. *Monanthia echii*, Wolff, Can. *Aradus betulæ*, Linn., Can.; *A. depressus*, Fabr., Monc. *Aneurus lævis*, Fabr., Monc. *Gerris gibbifer*, Schm., Tar. *Harpactor iracundus*, Poda, Can.; *H. sanguineus*, Fabr., Can. *Coranus ægyptius*, Fabr., Can. *Prostemma albimacula*, Stein, Can. *Nabis apterus*, Fabr., Can.; *N. ferus*, Linn., Can.; *N. rugosus*, Linn., Monc., Can.; *N. reuterianus*, Puton, Soria. *Piezostethus obliquus*, Costa, Monc. *Anthocoris minki*, Dohrn, and *A. confusus*, Reut., Monc. *Triphleps nigra*, Wolff, Can. *Microphysa pselaphiformis*, Curt., Can. *Acetropis gimmerthali*, Flor, Can. *Megalocerœa erratica*, Linn., and *M. linearis*, Fuessl., Monc. *Leptopterna dolabrata*, Linn., Monc. *Lopus flavomarginatus*, Don., including a dark variety, Monc., Can.; *L. gothicus*, Linn., Monc.; *L. sulcatus*, Fieb., Monc.; *L. cingulatus*, Fabr., Can. *Phytocoris femoralis*, Fieb., Monc. *Calocoris roscomaculatus*, De G., Can. *Homodemus M-flavum*, Goeze, Can., abundant on Umbelliferæ, etc. *Brachycoleus triangularis*, Goeze, Soria, on *Eryngium*. *Lygus kalmii*, Linn., Monc. *Charagochilus gyllenhali*. Fall., Can. *Capsus cordiger*, Hahn, Can., Monc., and var. *fallaciosus*, Reut., Can.; *C. scutellaris*, Fabr., Soria. *Systellonotus championi*, Reut., Monc., one male specimen, running on the ground amongst heath. *Strongylococis obscurus*, Ramb., Can.; *S. leucocephalus*, Linn., Monc. *Dicyphus pallidicornis*, Fieb., and *D. geniculatus*, Fieb., Monc. *Globiceps parvulus*, Reut., Soria. *Heterocordylus tibialis*, Hahn, and *H. tumidicornis*, H.-S., Monc. *Pachyxyphus cæsareus*, Reut., Monc. *Sthenarus ocularis*, M. & R., Monc., Can.; *S. bicolor*, M. & R., Monc. *Plagiotylus bolivari*, Reut., Can. *Psallus lepidus*, Fieb., and *P. varians*, H.-S., Monc.

Explanation of Plates.

Plate XV.

Northern slope of Moncayo, showing the "Santuario" and the Peña Negra, at a little above the upper limit of the beech-forest.

Plate XVI.

Fig. 1. *Pyropsyche moncaunella*, ♂, rather over twice the natural size.
2. „ „ neuration of fore-wing, from camera drawing.
3. „ „ neuration of hind-wing, ditto.
4, 5. „ „ „ „ fore-wings, from two specimens in which a missing vein is partially represented.
6. „ „ neuration of hind-wing in which a missing vein is partially represented.
7. *Phalacropterix muscella*, fore-wing, for comparison.
8. „ „ hind-wing „ „
9. *Pyropsyche moncaunella*, newly-hatched larva × 13 diam.
10. „ „ fully-grown larva ♂ × rather more than 2 diam.
11. „ „ case of ♂ × about $\frac{5}{2}$.
12. „ „ „ × $\frac{5}{2}$, pupa-case protruding.
13, 14. „ „ two cases ♀ × about $\frac{5}{2}$.
15. „ „ ♂ pupa × 3.
16. „ „ ♂ pupa, abdominal segments 6–10, more magnified, to show the mounting of dorsal armature on ridges.
17. „ „ ♀ pupa × 3.
18. „ „ skin cast by ♀ larva on changing to pupa, from camera sketch.

Notes on Xyleborus dispar, *Fabr.* By Dr. T. A. Chapman.

We had the pleasure of studying a colony of these beetles at Moncayo, and were able fully to accept all that we have been told about them by Ratzeburg, Ormerod, Blandford, etc. Perhaps the best account of them, including as it does their congeners and relatives, is that of H. G. Hubbard in Bulletin No. 7, U. S. Dept. Agr. 1897.

We found that the males never left the stumps in which they are bred, being wingless, and having jaws of little use except for tearing through any little overgrowth of fungus in the burrows. Their degeneration in size and form as compared with the females is, of course, associated with this change of habit.

Fig. 1.—Relative size and form of jaws of ♂ and ♀ *X. dispar*. The process to the right is a portion of tendon.

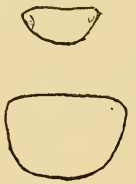

Fig. 2.—Relative width of head of ♂ and ♀ *X. dispar*. The greater anterior posterior diameter of that of the ♀ is due to the protrusion of the head, as much as to larger size.

The relative size of the head of the ♂ and ♀ is lineally as 3 to 2, the width of the male head being 0·6 mm. and of the female 0·9 mm.—making in volume a ratio of 27 to 8, or about $3\frac{1}{2}$ to 1.

The jaws also differ much in size. The greatest length of the male jaw is 0·21 mm. and of the female 0·33 mm. Each has the double tip as in the larval jaw, but in the female this is obviously supplemented by a straight margin, which is very slightly marked in the male; there is a still greater difference in the chitinization, the male jaw being brown and translucent, that of the female dense black.

We found that the female beetle makes the burrows, and ejects the gnawed wood uneaten. The larvæ live entirely on the fungus ("ambrosia") that grows in them.

When young they are straight, but not flounder-shaped, like those of *Platypus cylindrus*. When older they are curved and look not at all like *Platypus*, but very similar to those of other Scotylids or even ordinary Rhynchophora. Their jaws are pointed for scraping and tearing, and contrast with the pointed mandibles of bark beetles.

It may be noted that we saw no traces of beetles attacking anything but (recently) dead or dying timber,

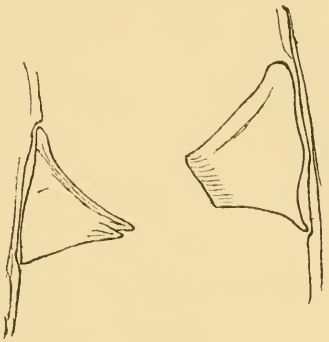

Fig. 3.—Jaw of larva of *X. dispar*, compared with that of *Scolytus multistriatus*.

and considering that they live not on the wood but on a fungus, it seems impossible they could live in healthy timber, even if Hubbard is right, in supposing that the beetles are able to plant and cultivate the fungus. On examining the larvæ after our return home, I was much interested in finding that they had a very remarkable structure in connection with the spiracles.

In a little longitudinal oval hollow there lies flatly against the surface what looks at first like two somewhat elaborated lips of an ordinary spiracle. If they were so the opening would be longitudinal instead of transverse. These two apparent lips, however, appear to be two parallel lobulated sacculi free at their posterior ends, but united together anteriorly where they are connected with a circular skin area, which is probably the true spiracular

opening, opening into the interior of the double sacculus. Round this centre circle is a larger one, that in some prepared specimens looks very like an ordinary spiracular circle. From the centre small circle, a tracheal vessel proceeds inwards. It would seem that the tracheæ open therefore into these sacculi, and not directly into the air,

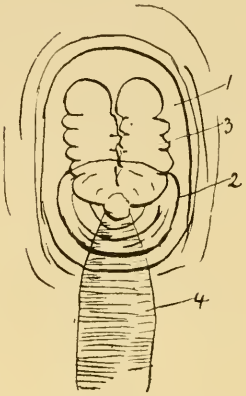

Fig. 4.—Spiracle of larva of *X. dispar*. 1. Hollow in which structure lies. 2. Appears to be spiracle proper. 3. Sacculus outside spiracle lying flatly in hollow. 4. Tracheal tube seen through skin.

Fig. 5.—Diagram of subsegmentation and arrangement of hairs of an abdominal segment of larva of *X. dispar*.

which must pass through the saccular walls. Probably a provision against moist surroundings.

I add a diagram of the disposition of the hairs on an abdominal segment of the larva and of its subsegmentation.

VI. *Descriptions of New Species of* Cryptinæ *from the Khasia Hills, Assam.* By Peter Cameron, *communicated by* George Alexander James Rothney, F.E.S.

[Read February 3rd, 1904.]

The species described here are in the collection of Mr. G. A. J. Rothney.

Etha lacteiventris, sp. nov.

Plumbeous black: the face, clypeus, mandibles, palpi, the inner orbits, the outer broadly on the lower-side, whitish-yellow: the base of the propleuræ broadly, the mark incised below, a line on the pronotum, tegulæ, tubercles, scutellums, the apex of the metanotum—the mark squarely narrowed in the middle behind—an oblique, pyriform mark on the apex of the metapleuræ above, united to a much larger mark, which is prolonged downwards at the base to the longitudinal furrow; an irregular, somewhat triangular, mark under the hind-wings and down the middle is a large, oblique mark, sharply pointed at the base, and the apices of the abdominal segments, yellow. Legs fulvous, the middle femora and apex of middle tarsi darker, their coxæ and trochanters white, the hinder coxæ white, black above, except at the base, the femora and tibiæ dark rufous, the femora above and the apex of the tibiæ blackish, the tarsi white, black at the base. Wings fulvo-hyaline, the stigma obscure testaceous, paler at the base. Joints 7–12 of the antennæ clear white, the scape and base of the flagellum brownish beneath. ♀.

Length 11; terebra 4 mm.

Face closely punctured, the clypeus smooth, as are the front and vertex; the front distinctly depressed and with a wide furrow in the middle. Thorax smooth; the sternal furrow wide, smooth; the other furrows are crenulated. First abdominal segment smooth, the lateral tubercles large; the other segments are faintly aciculated.

Etha khasiana, sp. nov.

Black; the face, clypeus, the inner orbits narrowly to the middle, the outer entirely from shortly above the middle, the mandibles, palpi, a broad line on the lower part of the propleuræ, a narrower one, not reaching to the apex, shortly above the middle; lower down, extending from the middle to the apex, a much larger mark, which,

at the apex, is prolonged downwards, the projection being curved and narrowed at the base and straight at the apex; the apex of the 1st abdominal white. The black part of the front coarsely irregularly striated. Face and clypeus minutely punctured. Thorax opaque, thickly covered with short pale pubescence which gives it a greyish appearance; mesonotum opaque, closely punctured, the centre at the base finely, but not very distinctly, transversely striated. Scutellum closely punctured; the apex of the post-scutellum strongly and closely punctured. Median segment behind the keel finely rugose; immediately behind it, it is obliquely irregularly fulvous. Wings hyaline, the stigma fuscous. The 7th to 10th antennal joints white, the basal two joints of the flagellum brownish beneath. ♀.

Length 10; terebra 4 mm.

Face in the centre closely and distinctly, at the sides sparsely and obscurely punctured; the clypeus obscurely punctured at the base; the front and vertex have a plumbeous hue and are very smooth and shining; the front has a distinct furrow in the centre. The meso- and the base of the meta-notum have a plumbeous hue and are very smooth and shining, this being also the case with the pleuræ. Mesosternal furrow wide, long and deep; that on the apex of the mesopleuræ is slightly, on the metapleuræ coarsely, crenulated. Petiole very smooth and shining, and having an elongate fovea near the base of the post-petiole; the other segments are less shining.

Gotra fulvipes, sp. nov.

Black; the face, oral region, mandibles, palpi, the outer orbits below broadly and the upper all round, white: the edge of the pronotum, a small round mark on the apex of the middle lobe of the mesonotum, the scutellar keels, the scutellums, a wide line round the apex of the metanotum, narrowed and rounded above, the base of the prosternum, the tubercles, the lower part of the mesopleuræ, the mesosternum except in the centre, the yellow on the sternum and pleuræ being divided at the base by a black wedge, which is sharply pointed at the apex, the apex of the mesopleuræ, the mark widely dilated above, a large mark, longer than wide, on the top corner at the base, a large oblique quadrangular mark near the apex, the apices of the abdominal segments above and the apical segments at the sides and beneath, yellow. The four front coxæ and trochanters yellow, the rest of the legs fulvous, the hinder coxæ white, a broad band down the outer-side in the centre and round the apex above, the hinder femora and tibiæ, rufous, the extreme base of the femora, their apex broadly, the base of the tibiæ narrowly and their apex broadly, black; the hinder tarsi pallid yellow, the claws black. Wings hyaline, the stigma and nervures black; the areolet very

small, narrowed at the base. The 7th to 12th joints of the antennæ clear white at the sides and below; the scape with a narrow white line below. ♀.

Length 12; terebra 2 mm.

Face and clypeus shining, strongly punctured and sparsely covered with white hair; the front with a wide and deep furrow down the centre and strongly transversely striated; the vertex on the lower part irregularly reticulated and striated, behind punctured. The apical half of the mandibles deep black. Mesonotum coarsely and closely punctured; the scutellums smooth; the metanotum has, in the middle, a smooth area, wider than long, widened from the base to the apex and bordered by stout keels laterally; the sides next to this smooth, the rest behind the keel irregularly, obliquely striated and punctured, the rest of the segment strongly irregularly reticulated all over, the reticulations more distinct at the apex. Petiole smooth and shining; the post-petiole laterally with some large, widely separated punctures; the 2nd segment closely and rather strongly punctured; the gastrocoeli smooth and shining.

Cryptus rufopetiolatus, sp. nov.

Black; the clypeus, except the oblique apex, a small oval mark in the middle of the face, the inner orbits entirely, the outer more broadly, except above, the mandibles, except at the apex, the palpi, the basal half of the scutellum, the post-scutellum, the metanotal spines and keel and the apex of the petiole, yellow: the scape of the antennæ beneath and the abdominal petiole, except at the apex, rufous. Legs rufous, the hinder tarsi black; the apical half of the 2nd tarsal joint and the whole of the 3rd and 4th, white. Scutellum closely punctured; the post-scutellum bifoveate at the base. The median segment behind the keel closely and finely rugose; the spines thin, broad, bluntly rounded at the top; the two are united by a narrow keel, which is roundly curved backwards; the space between the two keels is irregularly, mostly obliquely, striated, except the triangular space in the middle above; the oblique apex closely rugose and irregularly striated in the middle. Propleuræ closely striated; the meso- closely rugose and thickly pilose. The 6th to 12th joints of the antennæ white. Wings hyaline, the stigma black. ♀.

Length 17; terebra 5 mm.

Face closely punctured and thickly covered with white hair. Clypeus distinctly projecting; its basal and apical halves obliquely depressed. The upper inner orbits raised; the front and vertex depressed; the former smooth, obscurely aciculated; the vertex

stoutly obliquely striolated. Thorax opaque, the mesonotum covered with white pubescence. Abdominal petiole smooth; the base of the post-petiole depressed in the middle; the segments banded with yellow at the apex.

Cryptus himalayensis, sp. nov.

Black; the face, clypeus, labrum, mandibles broadly at the base, palpi, the orbits narrowly above, widely below, yellow; a broad line on the base of the prothorax, a slightly narrower one on the pronotum, the tegulæ, and the tubercles, lemon-yellow; the apex of the petiole rufous in the middle; the 2nd segment to near the apex, black suffused with rufous; the apex and the other segments ferruginous. The four front coxæ and trochanters whitish-yellow; the hinder black; the femora fulvous, the tibiæ and tarsi testaceous, the middle tibiæ slightly darker, the tarsi paler; the hinder femora and tibiæ rufous, the under-side of the apical joint of the trochanters, the apex of the hinder tibiæ and the base of the tarsi, blackish; the rest of the tarsi white. Wings hyaline, the nervures and stigma black. ♀.

Length 11; terebra 4 mm.

The scape and the four or five middle joints of the flagellum striated; the apex is, at the sides, strongly transversely striated, the centre coarsely punctured. Propleuræ, except at the base, closely longitudinally striated, finely and closely above, much more strongly below; the meso- opaque, granular, the middle and apex obscurely striated. The metapleuræ with a distinct oblique furrow below the spiracles; behind this they are finely longitudinally, in front more strongly, obliquely striated.

Cryptus bibulus, sp. nov.

Black; the scape of the antennæ beneath, the face, clypeus, mandibles, palpi, the inner orbits narrowly, the outer, except at the top, broadly whitish-yellow, the 3rd and following abdominal segments obscure rufous. The four front coxæ and trochanters white, the femora, tibiæ and tarsi fulvous; the hinder coxæ, trochanters, the femora, except at the base, broadly above, the apical three-fourths of the tibiæ and the base of the metatarsus, black; the fulvous colour on the hinder femora and tibiæ is darker than on the front legs. Wings hyaline, the stigma and nervures black. ♂.

Length 9 mm.

Face minutely punctured, the clypeus with some scattered punctures; the vertex roughly aciculated, the front smoother and not much depressed. Mesonotum strongly, closely and uniformly punctured; its middle lobe raised distinctly at the base; the scutellum

with large, clearly separated punctures; the post-scutellum more strongly punctured. Median segment closely and finely punctured behind the transverse keel; the rest coarsely rugosely punctured and sparsely covered with long soft white hair; there is only one transverse keel and in the middle, on either side, is an indistinct tubercle. Propleuræ at the apex above closely, the middle widely longitudinally striated; the meso- and meta- closely and uniformly punctured, and thickly covered with a white pile.

Umlima flexilis, sp. nov.

Black, the clypeus, the base of the mandibles, palpi, the scutellar keels, the sides of the 2nd abdominal segment on the apical half—narrowly at the base, much more broadly at the apex—lemon-yellow. The four front legs pallid fulvous, the apex of the fore tarsi and the middle tarsi above, the coxæ, except at the apex, black; the hinder legs of a darker and deeper rufous colour, the coxæ, trochanters, the apex of the femora narrowly, the base of the tibiæ somewhat more broadly, the apical third of the tibiæ, the base of the metatarsus broadly and the apical half of the 5th joint, black, the rest white. Antennæ banded with white beyond the middle, the flagellum thickly covered with longish pubescence. Face closely, finely rugosely punctured, the clypeus roundly convex, its apex rounded; both are thickly covered with long white hair. Labrum projecting, transverse, its sides oblique. The inner orbits distinctly margined; the front and vertex smooth and shining. Mesonotum thickly covered with short pale pubescence, closely, and in the middle, strongly punctured; the middle lobe is largely raised at the base, where the furrow is transversely striated. The median segment behind the transverse keel closely, finely and uniformly punctured; the middle between the two keels transversely striated; the base shagreened, not distinctly striated; the apical slope is much more strongly transversely striated; the pronotum laterally is stoutly striated. Pleuræ punctured, the middle and apex of the pro- above strongly striated; the middle of the meso- longitudinally striated. Pleural furrow wide and deep and extending to the apex where it is wider and deeper. Mesosternum closely punctured; its furrow wide and deep. Abdominal petiole smooth and shining, depressed at the apex, tuberculate behind the stigma; the other segments are more opaque and thickly covered with pale pubescence; the gastrocoeli very narrow, longish and shallow. ♂

Length 10 mm. ♂.

Friona varipes, sp. nov.

Black, the face, clypeus, mandibles, except the teeth, palpi, the inner orbits above and the outer below the middle of the eyes, a

yellow central line on the metanotum, an apical mark slightly thicker than it, curved at the base and not reaching to the edges, the apices of the abdominal segments narrowly and the ventral surface, yellow. The four front legs pallid fulvous, their coxæ pallid yellow; the hinder coxæ black, broadly white at the base above, the trochanters black, the femora dark rufous, tibiæ yellow with a fulvous tint, the extreme base and the apex more broadly black, the tarsi pallid yellow, their base narrowly and the apex of the last joint with the claws, black; the metatarsus is shorter than the 2nd and 3rd joints united. Wings iridescent, hyaline, the stigma and nervures black. ♂.

Length 14 mm.

Antennæ longer than the body, thickly covered with short black hair; beyond the middle is a broad white band. Face strongly punctured, the clypeus smooth, roundly convex, its apex black, oblique. Front bearing stout, irregular, slightly oblique keels and with a stout one in the middle. Thorax sparsely covered with long fuscous hair; smooth, except for a depressed, irregularly stoutly reticulated space at the apex of the middle lobe. Scutellums smooth and sparsely haired. The base of the metanotum smooth, the rest of it with stout, transverse, clearly separated striæ. Propleuræ stoutly striated except at the base; the meso- similarly striated except in the middle behind; the meta- stoutly striated, the striæ at the base intermixed with deep punctures; the striæ are mostly curved. The central furrow on the mesosternum deep, crenulated. Abdomen narrow, smooth and shining.

This is the largest of the known Indian species. It may be known from *F. frontella* by the darker-coloured legs, by the weaker more widely separated, striæ on the front and vertex, by the hair on the thorax being denser and longer and by the metatarsus being shorter compared with the 2nd joint. *F. curvicarinata* may be known from it by the curved keels on the front, by the smaller areolet and by the yellow mark on the metanotum being widely dilated at the apex.

Friona frontella, sp. nov.

Black; the face, clypeus, mandibles, palpi, the inner orbits and the outer above and below, the edge of the pronotum, tegulæ, scutellums, a narrow line down the middle of the metanotum from the transverse keel to the base of the oblique apex, which is surrounded by a broader band of similar colour and the apices of all the abdominal segments, the yellow on the penultimate extending broadly

to the base in the middle, yellow. The eight middle joints of the antennæ clear white, except on the top where they are marked with black. Four front legs pale fulvous, the coxæ and trochanters white, the hinder of a deeper fulvous colour, their coxæ broadly black on the sides and at the apex above, their base above white; the apex of the femora and the base of the tibiæ, the apex of the tibiæ and the base of the tarsi, black; the rest of the tarsi, except the last joint, white, and there is a testaceous band near the base. Wings hyaline. ♀.

Length 12; terebra 5 mm.

Face rather strongly punctured, the clypeus almost smooth; in the centre of the face is a narrow black line, continued to the base of the clypeus as a brownish one; there is a black line on the base of the clypeus. Front and vertex strongly striated; the central keel straight, the others more oblique. Mesonotum shining, thickly covered with long fuscous hair; the middle lobe clearly separated. The metanotum at the base smooth; it has a semicircular depression in the centre; the rest of the segment is strongly transversely striated; the apex has a slightly oblique slope; its centre is smooth, the sides obliquely striated. Propleuræ in the centre with large, stout, curved striæ, the top and bottom strongly aciculated; the meso- except in the middle behind, strongly longitudinally striated; the meta- strongly obliquely striated, the striæ becoming stronger from the base to the apex. Abdomen smooth and shining; the 2nd and 3rd segments strongly aciculated.

Friona curvicarinata, sp. nov.

Black; the face, clypeus, labrum, palpi, mandibles, a mark on the vertex opposite the ocelli and the apices of all the abdominal segments, yellow. The four front legs are yellowish, with a pale fulvous tinge; the middle tarsi blackish, the hinder coxæ pale yellow, broadly black at the apex, narrowly above on the outer-side, the trochanters black, the femora dull fulvous, broadly black above, the tibiæ black, the base to shortly beyond the middle, dull fulvous, the tarsi white, the base of the metatarsus narrowly and the extreme apex, black. Wings hyaline. Antennæ filiform, longer than the body, the scape below and a broad band shortly beyond the middle of the flagellum, white. ♂.

Length 13 mm.

Face rugosely punctured, transversely striated in the centre, thickly covered with short white hair, front and vertex smooth; in front of the ocelli are three rows of irregular, curved keels, all bent backwards in the middle; on the sides of the front are two or three

short longitudinal keels. Mesonotum smooth, thickly covered with long fuscous hair, distinctly trilobate; scutellum sparsely covered with longish fuscous hair; opposite the post-scutellum is a large broad yellow mark. Median segment elongate, the base behind the transverse keel smooth, the rest transversely striated, but not strongly or closely, the yellow marks commence near the keel, the broad part shortly behind the middle and extending right across the apex. The middle of the propleuræ finely longitudinally striated; the meso- above similarly striated, the striæ extending to shortly beyond the middle; the apex on the lower-side is more closely and finely striated; the meta- more strongly, closely obliquely striated and thickly covered with long white hair. Abdomen smooth, long and narrow.

Comes near to *F. frontella*; may be known from by the keels or striæ on the front being curved or transverse, not longitudinal, by the pleuræ not being so strongly or closely striated, and by the apex of the yellow line on the metanotum being much more largely dilated.

Hemiteles geniculatus, sp. nov.

Black; the metathorax rufous, yellow towards the apex, the inner orbits, an irregular mark on the upper part of the face, touching the yellow on the orbits, the palpi, middle of the mandibles, a line on the pronotum narrowed in the middle, a slightly broader one on the lower-side of the propleuræ, the tubercles, a large mark, narrowed and rounded at the apex on the lower-side of the mesopleuræ, yellow. The four front legs testaceous, the coxæ and trochanters pale yellow, the hinder legs rufous, their coxæ broadly black on the outer and inner-side; the basal joint of the trochanters pale yellow, the apical black; the apex of the femora and of the tibiæ and the base of the metatarsus black; the rest of the tarsi, white. Wings clear hyaline, the stigma pale, the nervures dark testaceous. Abdomen black, a band before the apex of the 1st, slightly more than the apical half of the 2nd, a mark on the side of the 3rd, the apex of the 6th and the whole of the apical segment, pale yellow. Scape of antennæ rufous. ♀.

Length 8 mm.

Face strongly, the clypeus less strongly punctured, except for a smooth band behind the apex; the front shagreened, the vertex closely, but not very strongly, punctured. Mandibles testaceous at the base, the apex black. Mesonotum closely rugose, the furrows transversely striated at the base. Scutellum punctured sparsely, the sides at the base stoutly keeled, the keels reaching to the middle;

the post-scutellum bifoveate at the base. Median segment closely rugose ; the areola broader than long, rounded at the base and apex ; the spines are small, triangular. The pro- closely, the mesopleuræ more strongly punctured ; the meta- distinctly punctured, striated towards the apex, the base smooth.

Hemiteles pulcherrimus, sp. nov.

Ferruginous, the head black, the face, clypeus and mandibles, yellowish-testaceous ; the palpi pallid yellow. Legs coloured like the thorax, the front and hinder tarsi more yellowish and paler in tint. Wings clear hyaline, the stigma pale fulvous, the nervures darker. Antennæ black, the scape and the base of the flagellum rufous, beyond the middle is a white band of 9–10 joints. ♀.

Length 8 ; terebra 3 mm.

Sides of face infuscated, punctured, the clypeus sparsely covered with long fuscous hair. Scutellum minutely punctured ; the post-scutellum raised in the centre, the raised part bordered by stout keels. The basal middle area of the metanotum is obliquely narrowed towards the apex, which is about one half the width of the base ; the areola is slightly longer than broad, its base rounded, the apex transverse, the sides straight ; nearly all the areæ are clearly defined ; the spiracular is divided into two by a stout keel immediately behind the spiracles. Pro- and mesopleuræ shining, impunctate. The sides of the 2nd and 3rd abdominal segments are black ; the petiole is closely and strongly aciculated, its apex laterally strongly and closely longitudinally striated, as is also the base of the 2nd segment, the striation being strongest in the middle ; the apical dorsal segment is oblique and yellow at the apex ; the cerci large, pilose.

Hemiteles ornatitarsis, sp. nov.

Black, the metathorax red ; the inner orbits from the front ocellus to the base of the clypeus, broader above, narrowed, almost interrupted, opposite the antennæ, the edge of the pronotum, tegulæ, tubercles, a large mark obliquely truncated behind on the lower part of the mesopleuræ, and the scutellums, yellow ; the petiole rufous, yellowish at the apex, the apex of the 2nd segment from shortly behind the middle yellowish-white ; the 3rd white on the sides at the apical half ; the apical two segments white, as are also the 2nd and third ventral segments. The four front coxæ and trochanters white, the femora rufous, the tibiæ and tarsi paler ; the hinder coxæ, apical joint of the trochanters, the basal two-thirds of the femora and tibiæ and the basal and apical joints of the tarsi, black ; the calcari and the 2nd and 4th joints of the tarsi white. Wings

very iridescent, the stigma pallid yellow, the basal nervures black, the apical pallid fuscous. ♀.

Length 7 ; terebra 1 mm.

Antennæ perceptibly thickened towards the apex ; the scape rufous below. Face closely punctured, more strongly in the middle ; the clypeus at the apex with shallow, scattered punctures ; the front and vertex closely and not so strongly punctured. Mandibles yellowish-testaceous, the teeth black ; the palpi pallid yellow. Mesonotum closely punctured ; the scutellum almost smooth. Median segment coarsely punctured, the middle transversely striated at the sides ; the basal central area slightly wider than long, obliquely narrowed towards the apex, the areola semicircular, nearly as wide as long, aciculated laterally ; the teeth blunt, stout ; the posterior median area of nearly equal width throughout, its base rounded. The apex of the pro- and the mesopleuræ closely and strongly punctured, the meta- for the most part closely, obliquely and strongly striated. Petiole smooth, the apex aciculated ; the gastrocoeli transverse, shallow, pale testaceous, the segment behind them obliquely striated.

The ♂ wants the white and red marks on the mesopleuræ ; the hinder femora are black at the apices, the tibiæ are for the greater part black ; the hind coxæ broadly black at the apex ; the white mark on the antennæ is smaller and their apical joints are dilated beneath.

Mesostenus respondens, sp. nov.

Black ; the 6th to 15th joints of the antennæ beneath, the face, clypeus, except at the sides, labrum, base of mandibles, palpi and the outer orbits—broadly on the lower-side—white ; a broad line on the pronotum, a mark on the apex of the middle lobe of the mesonotum, the scutellums, a broad line round the apex of the mesonotum—narrowed above, the lateral part appearing triangular through being gradually narrowed below,—the tubercles, a small mark on the apex shortly above the middle, a large mark on the lower-side, triangularly narrowed at the apex. A crescent-shaped mark immediately under the hind-wings, an oblique, conical mark on the metapleuræ and the apices of the abdominal segments —the basal two broadly, the penultimate still more broadly, the central narrowly,—yellow. Legs rufo-fulvous, the four front coxæ and trochanters pale yellow, the hinder pale fulvous above and with a somewhat triangular black mark in the centre, the apex of the hinder tibiæ, the extreme base of the tarsi and their apical joint

black ; their middle joints have a yellowish tinge. Wings rather short, hyaline. ♀.

Length 13–14 mm. ; terebra 2 mm.

Face and clypeus covered with short silvery hair, the vertex rugose, irregularly striated in the middle below the ocelli. Mesonotum finely and closely transversely striated, the striæ stronger towards the apex. Scutellums impunctate. Median segment closely reticulated, the reticulations becoming stronger and more widely separated towards the apex ; the spines rounded at the apex. Propleuræ shining, shagreened, striated at the apex ; the meso- closely punctured, reticulated at the base ; a smooth depression at the centre ; the meta- above closely reticulated, the lower border crenulated, the centre obliquely striated ; the base in the middle finely punctured. Abdominal petiole shining, obscurely shagreened, the sides with a double keel reaching to the stigmas ; the middle segments shagreened.

Mesostenus brahminus, sp. nov.

Black ; the orbits all round, but much narrower near the top on the outer-side and above the clypeus on the inner, the face, clypeus at the base, labrum, base of mandibles, palpi, a broad line on the middle of the pronotum, an oval mark on the apex of the middle lobe of the mesonotum, the scutellum, the apex of the post-scutellum, the apex of the metanotum all round, narrowest above, the lower edge of the propleuræ, the tubercles, a small, somewhat oval mark on the apex of the mesopleuræ above the middle, a large mark on the lower-side—narrowed towards the apex and triangular at the base—a short line on the mesopleuræ, bordering the keel, a large mark behind the spiracles and a smaller one, narrowed toward the apex, on the centre of the metapleuræ, and the apices of the abdominal segments, yellow. Legs rufo-fulvous, the four front coxæ and trochanters white, the hinder coxæ broadly black at the base beneath, at the sides and at the middle above ; the base of the hinder tibiæ, their apices more broadly, the base of the metatarsus and the apical joint black ; the rest white. Wings hyaline. ♀.

Length 12 mm. ; terebra 3 mm.

The 7th to 15th joints of the antennæ white, black above. Face and clypeus closely punctured and covered with short silvery hair. Front smooth ; the vertex with a stout smooth keel in the centre, the sides strongly marked with curved keels ; the ocellar region finely striated, the striæ curved. Mesonotum closely punctured, the furrows crenulated, especially towards the apex, the sides there finely transversely striated. Scutellum smooth, almost impunctate. The base of the median segment irregularly longitudinally striated ; in

the centre is an area bounded by two stout keels, wide at the base, gradually, but not much, narrowed towards the apex; the basal transverse keel stout; the middle and apex of the segment strongly reticulated, especially at the apex. The apex of the propleuræ covered closely with curved keels, the apical half in the middle with some stout, clearly separated oblique keels; the meso- stoutly obliquely striated, the lower part with the striæ closer; the meta- at the base finely obliquely striated, the apex more stoutly and with the striæ running into reticulations. Abdominal petiole smooth, almost impunctate; the other segment opaque, closely punctured.

Mesostenus misippus, sp. nov.

Black; the 7th to 14th joints and the scape of the antennæ beneath; the orbits broadly all round, an irregular mark on the face above the middle, the clypeus, except its oblique apex, labrum, palpi, and mandibles, except at the apex, white; a narrow line on the pronotum, a diamond-shaped mark on the mesonotum at the apex, a small line opposite the tegulæ, the scutellums, a line following the outline of the upper-side of the apex of the metanotum to shortly below the spines, the lower edge of the propleuræ, the tegulæ, a small and a larger mark immediately below the hinder wings, a large line on the lower-side of the mesopleuræ, irregularly curved upwards at the apex, a large oblique mark slightly narrowed above, on the centre of the metapleuræ, and all the abdominal segments at their apices, yellow. Legs rufo-fulvous, the four front coxæ and trochanters yellow; the hinder coxæ black at the base above and more widely at the apex below; the basal joint of the trochanters black above, the hinder tarsi white, the base fulvous, the apical joint black. Wings hyaline. ♀.

Length 12; terebra 2 mm.

Face closely punctured and closely covered with short white pubescence; the vertex and front strongly and closely obliquely striated; the sides of the front depressed, the depression somewhat triangular, finely and closely striated on the outer-side. Mesonotum closely punctured, thickly covered with short white pubescence, the base of the middle lobe obscurely transversely striated; scutellums smooth. Median segment behind the keel finely rugose, in front of it, in the centre, irregularly reticulated, the rest closely rugosely punctured; the spines broad, rounded at the top. Propleuræ strongly and closely striated except on the top and bottom; the meso- finely rugose, below the tubercles finely striated; the meta- finely rugose, and obscurely obliquely striated. Abdominal petiole aciculated.

Agrees closely with *M. respondens*; it is more slender,

the face is broadly black in the middle, the front is furrowed, not keeled; there are no keels on the middle of the metanotum at the base, and the hinder tibiæ and tarsi are not marked with black.

MESOSTENUS CLARINERVIS, sp. nov.

Black; the face, clypeus, mandibles at the base, the inner and outer orbits, the white on the inner slightly dilated at the base, and apex of the mandibles, white. A broad line on the basal half of the pronotum, the base of the tegulæ, a mark, slightly broader than long, on the apex of the middle lobe of the mesonotum, the scutellar keels, the apical half of the scutellum, the yellow continued down the base as a triangle, the post-scutellum and its keels, a somewhat conical mark on the base of the metanotum, its apex transverse, the teeth, a line on the lower-side of the propleuræ, the tubercles, an oblique, somewhat oval, mark on the base of the mesopleuræ, a smaller, more irregular mark on the lower-side at the apex, a crescent-shaped, large mark on the sides of the mesosternum, a mark, somewhat conical on the lower-side, on the base of the metapleuræ at the top, a larger oblique one in the middle, and a line on the apices of all the abdominal segments, the basal three being the larger, yellow. Legs ferruginous, the four anterior coxæ white, the tips of the tarsi black. Wings hyaline, the costa and stigma fuscous, the nervures at the apex testaceous. Antennæ black, the five middle joints white, lined with black above; the apex brownish. ♀.

Length 13; terebra 5 mm.

Face rough, the clypeus obscurely punctured at the base; on the sides of the clypeus is an oblique, broad black mark, extending from the base of the mandibles to shortly above the base of the clypeus; the apical half of mandibles black. Front and vertex depressed; the former shagreened, the latter with a distinct keel down the centre, its sides obliquely striated; the striæ stout and irregular. Mesonotum almost opaque, closely and strongly punctured; the scutellum almost impunctate. Median segment coarsely reticulated, most strongly on the apex, where, in the middle, the reticulations are transverse and much wider than long; the base is deeply depressed; from the middle at the base runs an oblique furrow, bordered on the basal side by a sharp, stout keel, the keel bordering the apex of this furrow being smaller and less clearly defined; the triangular space bounded by this furrow is less strongly and more closely punctured than the rest of the segment; the teeth are large, stout. The upper part of the propleuræ at the base above with some stout, semi-oblique striations; the apex with slightly thinner oblique striæ, the lower part with stout, longitudinal keels, most of them

having a slight curve. Base of mesopleuræ coarsely longitudinally striated; the upper part, except at the apex, obliquely and longitudinally striated. Upper part of metapleuræ closely reticulated, the lower stoutly obliquely striated. Abdomen smooth and shining, the 2nd and 3rd segments closely punctured.

The posterior coxæ may have a yellow mark on the base and apex. Characteristic are the three yellow marks in a triangle, on the metanotum.

Mesostenus reticulatus, sp. nov.

Black; the face, oral region, the inner orbits to the end of the vertex, mandibles, except the teeth, palpi, two lines on the prothorax next to the head, a line on the centre of the pronotum, tegulæ, scutellum, the apex of post-scutellum, two large elongated marks on the apex of the metanotum, including the spines, and the apices of the abdominal segments, yellow. The 5th to 12th antennal joints yellowish-white. Legs fulvous, the hinder coxæ below, apex of hinder femora and tibiæ, black. Wings hyaline, the stigma testaceous, nervures fuscous. ♀.

Length 15–16 mm.

Front and vertex stoutly striated in the middle, the striæ stout, irregular, semi-oblique, in places forming irregular reticulations; smooth and shining. Face and base of clypeus coarsely punctured; the apex of the clypeus smooth, semi-circularly depressed. Middle lobe of the mesonotum closely punctured in the centre, the sides, especially towards the apex, coarsely striated, the centre with a broad shallow, but distinct, longitudinal depression; the outer lobes on the base and inner-side stoutly irregularly striated—scutellums smooth, sparsely haired. Median segment strongly reticulated, except at the base, where, in the centre, there is a small smooth space behind the transverse keel; the reticulations on the base laterally are much weaker than on the rest of the segment. The teeth are large, stout. Propleuræ, except at the base, strongly irregularly striated; the base of the meso- above coarsely rugosely punctured and with some irregular striæ; the base of the meta- rugose, coarsely reticulated, the apex coarsely obliquely striated. The pleural furrow at the base is narrow, deep and crenulated.

Mesostenus caligatus, sp. nov.

Length 9; terebra 2 mm. ♀.

Very similar to *M. salutator*, but smaller; there are no white marks on the pleuræ, the median segment is not so strongly reticulated, but its base is distinctly punctured, almost as strongly as its

apex, and the former is gradually, and slightly rounded from the ocelli to the base of the antennæ. Black, the inner orbits from the base of the clypeus to near the end of the vertex, the outer more broadly below—the yellow becoming dilated round the base of the mandibles, the palpi, the top and bottom of the prothorax, tegulæ, scutellums, the apex of the median segment, including the spines, broadly at the sides, tubercles, a large crescent-shaped mark behind the metathoracic spiracles, a large mark on the apex of the middle lobe of the mesonotum ; the apex of the 1st abdominal segment, of the 2nd broadly, the apical segments entirely and the basal two segments beneath, yellow. Legs rufo-fulvous, the four front coxæ and trochanters white ; the apex of the hinder tibiæ infuscated.

Face strongly and closely punctured, the upper part laterally obscurely striated ; the clypeus more weakly and closely punctured ; the front and vertex coarsely shagreened, the front slightly depressed and keeled down the centre. Mandibles ferruginous before the teeth. Mesonotum shagreened, shining, covered with a short black pile. The keel on the metanotum is broadly and roundly curved backwards in the middle ; the space behind it coarsely reticulated, the sides at the base smooth and shining ; the keels on its centre straight and slightly converging towards the apex ; the reticulations on the yellow sides are golden. Propleuræ stoutly obliquely striated, except at the base ; near the base is a stout perpendicular keel. Mesopleuræ punctured and irregularly striated ; the metapleuræ strongly, almost uniformly and slightly obliquely, striated. Wings hyaline, the stigma fuscous, paler below, the nervures darker. First abdominal segment smooth and shining, becoming gradually dilated from the middle to the apex, the middle segments aciculated.

Mesostenus salutator, sp. nov.

Black, a broad line on the pronotum, tegulæ, a squarish mark on the apex of the middle lobe of the mesonotum, the scutellar keels, the scutellums, two broad marks on the sides of the apex of the median segment, the base of propleuræ, tubercles, an elongated curved line on the mesopleuræ, extending from below the tubercles to the base of the middle coxæ, a long crescent-shaped mark—narrowed on the inner end, more truncated below—behind the spiracles, a line following the oblique keel on the metapleuræ—broad at the base, becoming narrowed towards the apex—and the apices of the 2nd to 5th and the abdominal segments entirely, yellow. Four front legs fulvous, their coxæ and trochanters pale yellow, the apex of hinder tibiæ, the base and apex of the hinder tarsi black ; the rest of the tarsi white. Wings hyaline, the stigma and nervures black. ♀.

Length 11 ; terebra 2 mm.

Joints 6 and 7 of the antennæ white, black above; the scape brownish below. Face closely punctured, bare; the sides of the raised central part, its apex and the sides of the clypeus black, the black lines united together, the rest yellow. Mandibles black, the basal half yellow, edged with black. Palpi yellow; the apical joint of maxillary fulvous. Front smooth and shining; the vertex irregularly closely, strongly and somewhat obliquely striated and slightly depressed before the ocelli. Mesonotum closely and strongly aciculated. Base of the metanotum closely, irregularly striated, most strongly on the outer-side; in the centre are two keels; the only transverse keel is curved backwards in the centre; the rest of the segment is closely, irregularly reticulated; at the apex, in the middle, is a smooth space with three longitudinal keels. Propleuræ for the most part strongly longitudinally striated; at the top is a stout oblique keel. Mesopleuræ finely rugosely punctured at the base and top, the punctures running into striæ. The base of the metapleuræ on the lower part depressed, stoutly crenulated, the lower and apex strongly obliquely striated, the striæ running into reticulations at the base. Petiole smooth and shining; the sides to the thickened apex with two sharp keels; the 2nd to penultimate segments closely, but not strongly, punctured.

Mesostenus versatilis, sp. nov.

Length 15; terebra 4 mm.

Agrees closely in coloration and form with *M. reticulatus* and in having the median segment reticulated; but may be known by the shorter hinder coxæ, which are also devoid of black, by the blackish hinder trochanters and by the longer and thinner spines on the metathorax.

Antennæ stout, broadly annulated with yellow in the middle. Black: the face, clypeus, base of mandibles, palpi, the inner eye orbits, an elongated line on the base of the pronotum, gradually narrowed towards the apex, tegulæ, tubercles, scutellar keels, scutellum, a crescent-shaped mark behind the posterior wings, the sides of the obliquely sloped apex of the median segment, its spines, about the apical fourth of the basal three abdominal segments, the middle more narrowly and the apical entirely, yellow. Legs rufous, the extreme apex of the hinder coxæ, more or less of the hinder trochanters, the apex of the hinder femora, the base of the hinder tibiæ more narrowly and their apex more broadly, black. Wings hyaline, the nervures testaceous, the stigma black. ♀.

Sides of the front stoutly obliquely striated, the middle depressed. Mesonotum thickly covered with short hair; the sides of the middle lobe at the base and the outer-sides of the furrows striated. Scutellum

smooth, sparsely covered with short fuscous hair. Median segment shagreened behind the transverse keel; the base depressed and having some stout longitudinal keels, the centre smooth and bounded by curved keels; the rest of the segment irregularly reticulated, more widely at the base, than in the middle or apex. There are three stout keels on the base of the propleuræ, the top, especially at the apex, marked with irregularly curved keels, the middle with stout, distinctly separated ones; the lower part closely and strongly aciculated. Mesopleuræ coarsely aciculated, the apex above smoother and more shining, the lower part stoutly striated. Metapleuræ closely, irregularly reticulated.

Mesostenus maculiceps, sp. nov.

Black: the scape of the antennæ beneath, the apex of the 6th and the 7th to 10th joints white beneath; the palpi, apex of labrum, clypeus, a large wedge-shaped mark on the face below the antennæ, a line on the pronotum, narrowed in the middle, the apex of the middle lobe of the mesonotum, scutellums, the scutellar keels, two large marks on the obliquely sloped apex of the median segment, its spines, the base of the propleuræ, tubercles, the apex of the 1st abdominal segment, of the 2nd and 3rd and the apical two entirely, yellow. Legs rufous, the four front coxæ and trochanters yellow, the tarsi spinose, the hinder white, black at base and apex. Wings hyaline, the stigma and nervures black. ♀.

Length 10 mm.

Face closely punctured and covered with short, white pubescence, the clypeus smooth, the front and vertex closely punctured. Mesonotum opaque, alutaceous, the furrows distinct, the scutellum smooth. Median segment finely rugose; behind the basal keel striated; the apex in the middle irregularly transversely striated. Except at the base the propleuræ are stoutly, obliquely striated; the meso- opaque, shagreened, obscurely striated; the apex of the meta- obliquely striated. The mesopleural furrow distinct, curved, striated. Mesosternum shining, aciculated, the central furrow widened at the apex.

Phygadeuon latiannulatum, sp. nov.

Black; the scape beneath and joints 10–16 of the antennæ clear white; the clypeus, mandibles, except at the apex, and palpi yellowish-white, the base of the pronotum and tegulæ, yellow, the apical fourth of the 1st, the apical half of the 2nd, and a mark in the centre of the 3rd abdominal segment, rufous. Legs: the four anterior pale rufous, the coxæ and trochanters pale yellow, reddish above, the femora rufous, their extreme apex black, the tibiæ fuscous-

black, dark rufous at the base, the hinder tarsi white, black at base and apex. Wings hyaline, the stigma fuscous. ♂.

Length 7 mm.

Face closely punctured, thickly covered with white hair, the front and vertex shining, distinctly, but not closely, punctured and thickly covered with short, fuscous hair. Mesonotum punctured in the centre and thickly covered with short fuscous hair. Scutellum almost impunctate. Median segment obscurely punctured, thickly covered with long white hair; its basal areæ are indistinct; the basal three clearly defined, the central rounded above. Pro- and mesopleuræ shining, obscurely punctured, the lower part of the former obscurely striated in the middle. Mesosternum smooth, thickly covered with white pubescence.

Comes near to *P. labiale* but is larger, the antennæ are longer and more slender; otherwise may easily be separated by *P. labiale* having the clypeus and the four front coxæ black, by the metatarsus being entirely black and by the narrower white band on the antennæ.

Phygadeuon striatifrons, sp. nov.

Black; the labrum and middle of mandibles dull testaceous, the palpi, tegulæ, tubercles, the basal third and a mark in the centre of the 1st abdominal segment, almost the apical half of the 2nd and the apical two segments, clear white. Legs pale testaceous; the coxæ and trochanters white, the hinder coxæ black, more or less testaceous on the under-side, the femora and tibiæ dark brownish, the femora black above, the hinder tarsi white, the basal two-thirds of the 1st and the last joint blackish; the joints spinose at the apex; the penultimate with a bunch of long stiff hairs. Wings hyaline, the stigma pale testaceous. The scape and the 8th to 13th joints of the antennæ beneath, white, ♀.

Length 9; terebra 2 mm.

Face opaque, roundly bulging out in the middle; the vertex and upper part of the front furrowed down the middle and stoutly transversely striated, the sides strongly aciculated, the lower part of the front smooth; the clypeus sparsely punctured above. Mesonotum finely punctured; the furrows only indicated at the base. Median segment longish, its apex oblique; the basal area longer than broad, gradually narrowed to less than half the width of the base at the apex; the areola elongate, obliquely narrowed at the base and apex; all the areæ distinct; the outer of nearly equal width throughout; the spines are stout, triangular. Propleuræ finely and closely punctured, the middle striated; the meso- and metapleuræ closely punctured, as is also the mesosternum. Wings hyaline, the

stigma pale, the nervures black at the base, fuscous towards the apex; the transverse median nervure interstitial; the areolet is longer than wide. Petiole longer than the 2nd abdominal segment, smooth and shining.

PHYGADEUON LABIALE, sp. nov.

Black; the labrum, base of mandibles and palpi white, the four front trochanters white; the femora and tibiæ fulvous, the tarsi paler; the coxæ, basal joint of hinder trochanters, apex of hinder tibiæ all round and of femora above and the basal and apical joints of the tarsi, black; the middle of tarsi and the spurs white; the apex of the 1st abdominal segment, the 2nd except the sides above, and two marks on the apex and the 3rd, except on the sides and apex, reddish; the apical segments are bordered with white. The scape of antennæ in the middle beneath and joints 12–14 white. Wings hyaline, the stigma and nervures fuscous. ♂.

Length 6–7 mm.

Face opaque, closely punctured and thickly covered with short white hair; the front and vertex strongly punctured, the punctures larger and more widely separated than they are on the face. Thorax thickly covered with white hair, which is longer on the pleuræ and median segment; the mesonotum shining, uniformly punctured, the punctures large and distinctly separated; the scutellum more shining and with the punctures smaller, sparser and covered with long and white hair; post-scutellum smooth and shining; the depression at the side wide, deep and marked with three stout keels. The base of the metanotum has a deep depression; at the base are two curved keels, which do not reach to the extreme base; the space enclosed by them is shining and finely punctured; the space before them is irregularly punctured; the apex has an oblique slope and is coarsely shagreened, the top of the oblique slope is bordered by a stout keel which bulges backwards into a triangle; there are three distinct areæ on the apex; the areola is rounded at the base, its sides straight, oblique and slightly converging towards the apex; the posterior median area is rounded at the base, the sides converge slightly towards the apex; it is coarsely, irregularly transversely rugose; the lateral areæ are strongly obliquely striated. Propleuræ and mesopleuræ strongly punctured, the former striated behind; the latter smooth in the middle. Metapleuræ closely punctured, more strongly above than below; its median keel is not very distinct and is interrupted in the middle.

PHYGADEUON PALLIDINERVIS, sp. nov.

Black; the apex of the 1st, and the 2nd and 3rd abdominal seg-

ments ferruginous, the apical two segments white, the legs rufous, the apex of the hinder tibiæ and the tarsi black ; the wings hyaline, the stigma pale yellow. ♀.

Length 5 ; terebra 1 mm.

Antennæ stout, black, the 8th and 13th joints clear white, except above, the 2nd and the apices of the 3rd and 4th joints testaceous. Front and vertex closely and strongly punctured and covered with white pubescence. Mandibular teeth rufo-testaceous; the palpi white. Thorax thickly covered with white hair ; mesonotum strongly punctured ; the scutellum very shining and obscurely punctured. Metanotum at the base in the centre smooth, bearing two, not very distinct, keels which curve round to the right and left ; the middle region is rough, obscurely punctured ; the apex above is bordered by a stout keel which curves backwards in the middle and is, at the top, obliquely striated ; the rest is roughly punctured; the apex has an oblique slope and is thickly covered with long white hair. Pleuræ for the most part strongly and closely punctured.

The base of the post-petiole is strongly longitudinally striated, the striæ strongest on the sides ; the 2nd and 3rd ventral segments are testaceous. The punctures on the propleuræ run into striations at the apex.

VII. *A New Species of Bembex from the Khasia Hills, Bembex Khasiana*, sp. nov. By Peter Cameron, *communicated by* George Alexander James Rothney, F.E.S.

[Read February 3rd, 1904.]

Lacteous-yellow ; two large oblique marks on the clypeus above, the occiput, except near the eyes, vertex, the front, except above, and two large lines on the upper half, roundly converging on the inner-side above, a line, narrow above, broadly dilated below, on the frontal keel, the prothorax, except for an irregular mark on the apex of the pronotum, broader at the base than at the apex, a line on the apex of the scutellum, a shorter, narrower one on the post-scutellum, two oblique marks, roundly dilated upwards on the inner-side and with a sharp projection on the lower, inner-side on the base of the metanotum, an irregular mark on the sides on the top of the apical slope, the pleuræ, except for an irregular line on the base of the meso- above, the sutures, an irregular broad line on the upper half of the metapleuræ above, two large marks on the centre of the mesosternum and a mark on the sides at the apex, black. First abdominal segment black, with a yellow mark, narrowed gradually on the inner-side and extending on to the ventral surface ; the 2nd segment is black on the extreme base ; its apex is more broadly black, the band dilated backwards in the middle and having there two broad, large projecting marks united to it ; the base of the 3rd segment black, with two broad marks near the centre, its apex more broadly black and dilated backwards in the middle, the projection being gradually narrowed ; the 4th and 5th segments are similarly marked ; the apical entirely black. Ventral surface black, except on the sides, slightly, of the basal three segments. Legs pallid yellow ; the coxæ for the greater part and the femora broadly black above. Tarsi stout ; the anterior with the joints broad ; the 2nd, 3rd and 4th narrow at the base, broadly dilated at the apex ; the spines long, stout, rufous ; the metatarsus is not much narrowed at the base, with the anterior and not at all with the posterior. Calcaria narrow, sharply pointed, reaching close to the middle of the metatarsus ; the 2nd, 3rd and 4th joints become successively shorter and narrower on the anterior.

Length 20 mm.

The ♂ I do not know. Comes near, in Bingham's system, to

B. fossoria. The scape of the antennæ is pale yellow below and may be so at the base above. The hair on the head is long and fuscous; on the thorax darker and shorter. Mandibles pale yellow to the basal tooth.

Hab. Khasia Hills. Coll. Rothney.

VIII. *Notes on the Life History of* Gongylus gongyloides, *a Mantis of the Tribe Empusides and a Floral Simulator.* By Captain CHARLES E. WILLIAMS, M.A., M.B., Indian Medical Service. Communicated by Dr. DAVID SHARP, M.A., F.R.S.

[Read February 3rd, 1904.]

THIS Mantis, of which a living immature specimen is exhibited, is found in many parts of Central and Eastern India, in Bengal and the Central Provinces and Madras, in Ceylon, and in Lower Burma.

The appearance and habits of the immature insect were described by Dr. J. Anderson to the Asiatic Society of Bengal in 1877 (*vide* Proc. Asiatic Society of Bengal, 1877, p. 193). His description, which is rather meagre, is quoted at length in the "Cambridge Natural History" (Insects), vol. v, pp. 254–257. So far as I am aware, no full account of its Life History and habits has been published hitherto.

The following account is compiled from my own notes made during a period of nearly two years, during which I kept numbers of these insects under observation, and watched their development from the egg to the adult form.

Owing to their retiring habits and protective form and coloration, they are extremely difficult to find when searched for. Although I have reason to know that they are not uncommon near Rangoon, no European of my acquaintance had ever seen this species in Burma. However, both De Saussure and Brunner von Wattenwyl mention Pegu (*i. e.* Lower Burma) as its habitat.

The chief distinctive external characters of the insect consist in the peculiar modifications of the prothorax, and in the leaf-like expansions of the lateral margins of the dorsal abdominal plates, and those of the distal extremities of the femora of the two hind pairs of limbs, together with the elongated bifid cephalic crest.

These special characteristics are found to be more or less developed in other members of the tribe Empusides, but

in no other species has the modification of the tribal type taken precisely the same lines as in *Gongylus*.

The prothorax is elongated into a narrow stalk, leading to a somewhat diamond-shaped or disc-like expansion at the insertion of the front pair of limbs (raptorial limbs). This disc is coloured on its ventral aspect a brilliant azure-blue, the angles and margins of which may be more or less tipped with a warm purple hue. In the centre of this disc is a deeply pigmented black spot triangular in shape. Closely correlated with this colouring and formation is the attitude adopted by the insect. When at rest and feeding it hangs head downward, the ventral surface of the thorax and prothorax being turned skywards and the dorsal surface towards the ground. The azure-coloured disc is thus turned towards the brightest part of the sky, or preferably towards the blazing sun all through the hours of daylight, and this part of the insect assumes the appearance of a blue flower, by which other insects, the prey of the Mantis, are attracted to it; this deceptive effect is enhanced by the stalk-like elongation of the prothorax, by the black central spot, which it has been suggested mimics the opening of the tube of a corolla, and by the gently swaying movements of the insect from side to side, as if it were a blossom agitated by the breeze. The dorsal aspect of the prothorax, and the dorsal surface of the insect generally, and all other parts of the ventral surface, except the prothoracic disc, are varied in colour, and marked by bands of black pigment on a ground of light or dark brown, and here and there by green markings, and this more sober colouring is adapted to conceal the Mantis both from its prey and from its possible enemies.

The female, on passing to the winged stage, develops a relatively small pair of wings and of tegmina. The former are too small for flight, and the tegmina, which do not reach so far as the posterior end of the abdomen, are greatly modified to resemble dead and shrivelled leaves. The female is therefore to all intents and purposes wingless.

The adult male on the other hand is more slenderly built, and has large wings adapted for powerful flight. The wings and tegmina both reach some distance behind the posterior end of the abdomen, and they are handsomely ornamented by oblique black lines, not unlike the marking on the tegmina of some species of Harpagides. The adult

male has long bi-pectinate antennæ, gracefully curved: while the antennæ of the female are short, hair-like, curved outwards, with fine rounded hooks at the free end, and never reaching beyond the tip of the cephalic crest. The prothoracic disc is in the male narrower and more diamond-shaped than in the female, which is altogether a more heavily-built insect in association with its sedentary habits. The male adopts the same habits as the female for catching its prey.

These insects are found hanging from creepers and the foliage of trees and shrubs in country lying high and well drained; also the female adult was found on hay-grass about eighteen inches high. I met with two groups of half-grown nymphs on creepers in my own garden. There was a difference of colour in the two groups, the one was of a light warm brown ground colour, while the other was of a sooty hue. The markings of both varieties appear to be similar, and the same male interbred with both varieties of females. Their colours were inherited by the offspring. The specimen shown is of the darker variety.

Food.

When feeding the insect invariably holds the fore part of the prothorax towards the brightest light available at an angle with the body of between thirty and forty degrees; insects are frequently captured and are generally devoured entirely, with the exception of the wings and some of the legs. The favourite food of the adult insect and of the larger nymphs consists of small lepidoptera; chiefly of a Skipper closely allied to, if not identical with, the British Dingy Skipper. This butterfly abounds on the creepers and flowering shrubs frequented by *Gongylus* during the period when the Mantis is preparing for its last ecdysis, viz. towards the end of the rainy season in September and October, and on till the end of December. Much larger butterflies also, including *Papillios*, are captured by the adult insect. The nymph is of a retiring nature, and hides all but its prothoracic disc and stalk behind the foliage, while the adult insect displays its whole body and limbs at the end of a twig or spray, or on a spike of flowers. It maintains this inverted position exposed to the full sunlight without any serious risk from its enemies, being evidently protected by its peculiar colouring and form. I have noticed large nymphs of *Gongylus* living for days and

weeks on sprays frequented by lizards of all sizes and remaining unhurt. The large Calotes lizards are dangerous enemies, and when the leaves fall from the bushes during the hot dry weather of February and March the Mantis frequently becomes the victim of this lizard, which climbs the stem of the bush from below and comes upon the Mantis from behind. It will be noticed that the protective coloration and markings of the dorsal surface of the Mantis, which is turned downwards, are very elaborate, as if to conceal it against a possible foe advancing from that direction, whence indeed the lizard usually comes. In seizing the Mantis Calotes usually bites through the prothoracic stalk ; the fore part of the insect bearing the disc and the spiny raptorial limbs and head, falls to the ground, while the more fleshy thorax and abdomen are ingested. The tough exoskeleton of these parts is easily digested by the gastric juice of the lizard.

It may be added that the Mantis does not necessarily frequent native plants, or those having blue blossoms; it may be found alike on exotic or on indigenous plants, and on floral spikes bearing blossoms of any other colour. It appears to be just as attractive to insects in these situations as if it were on blossoms of its own colour.

When irritated or alarmed by the close approach of some threatening object, or of an enemy, this Mantis adopts a very curious defensive attitude. The raptorial limbs, which are usually held folded together in front of the prothoracic disc, are now widely separated until they lie in the plane of the disc, the inner aspect of the coxæ being directed forwards; the femora and tibia remain folded upon them as before. It is now seen that the internal aspect of the coxæ is coloured a brilliant purple, dotted over with circular white or pale blue spots, and the femora have a warm red-brown coloration on this aspect. The effect produced by this coloration and by the blue prothoracic disc showing between the separated coxæ, is that of some curiously-shaped and brilliantly-coloured orchid. If the irritating object, *e. g.* the finger or point of a stick, approach too near, the Mantis strikes furiously at it with its fore limbs repeatedly and with lightning-like rapidity. This hostile attitude is shown by both immature and adult insects, and is first exhibited by the nymph when the coloration of the prothoracic disc and anterior coxæ is matured, *i. e.* about the end of the third month of pupal

life. The attitude is plainly associated with the peculiar coloration. I have no doubt that even a large lizard would be deterred from seizing the Mantis, if confronted by it in this manner. I have seen it adopt this attitude only when some large beetle, butterfly, or hymenopteron investigated the floral expansion; but on these occasions it did not strike out at the intruder, but contented itself with an exhibition of the warning or hostile colour-effect. I never saw wasps or bees captured by this Mantis, but small beetles and hymenoptera are frequently seized.

When adopting the hostile attitude described, the Mantis sways the whole body rhythmically to and fro. If in the adult stage, the tegmina are raised slightly and spread outwards and ventral-wards, until their outer edges, which are serrated, come into contact with the femora of the hinder limbs; the lateral movements of the body then give rise to friction between the tegmina and femora, and a hissing sound is thus produced; the wings are slightly spread over the abdomen, which is distended. In the nymph, which has the abdomen curved over the thorax, so that its dorsal surface looks ventral-wards, in the same direction as the prothoracic disc, a still more astonishing phenomenon is exhibited in association with the hostile attitude of the fore limbs. The abdomen is greatly distended, and both widened and elongated; upon the larger segments broad bands of a bright purple colour, and on the narrow hinder segments a large black eye spot, are developed. This remarkable effect is produced by the elongation of the abdomen bringing into view portions of the segments, including the delicate inter-segmental membranes, which are usually hidden from view. These are naturally coloured purple or black according to their serial position. It is possible that under excitement this purple coloration of the deeper-lying tissues may be actually increased in some way, but this is doubtful. The insect when dropped to the ground will often feign death for a short time, lying on its back with its limbs contracted above the thorax as after real death.

I will now trace the life history of the insect beginning from the attainment of the winged stage. The nymph effects its last ecdysis in the middle of October, and the winged males appear among the females a fortnight or three weeks later. Within twenty-four hours of fertilization the female commences to form its first egg-case.

Mid-day is chosen for this work. The insect retires from its usually exposed position to within the shelter of the foliage, and constructs the egg-case on a branch of the bush near the stem, or on the stem itself. If on a branch, it is always placed on the under-side, and constructed from the stem outwards towards the periphery of the bush. If situated on the stem it is formed from below upwards. The insect, having taken up her position, proceeds to pour out secretions from the accessory genital glands, with which she builds up the ootheca. These secretions appear to be of two kinds; the one is a thick viscid semi-transparent fluid which very rapidly hardens to the consistency of horn; the framework and nearly the whole bulk of the structure is formed of this material, and the eggs are extruded and placed in rows, with their long axis vertical to the branch on which the ootheca is built. The second secretion is thinner in consistency, and as it pours out is beaten up into a white foam or lather-like mass, by the very rapid rotation of two small spatulate organs which are protruded at the sides of the genital orifice. This lather-like substance envelops the egg at the moment of extrusion, so that the manner in which it is placed in a position at right angles to that it occupies during its exit from the oviduct cannot be made out. As the eggs are placed in position the lather is constantly being swept aside by the end of the abdomen until it occupies a position on the outside of the ootheca, which it entirely clothes throughout to a depth of $\frac{1}{8}$ of an inch. Its function appears to be, in the first place, to protect the egg from parasitic insects until it is firmly placed in its matrix, and secondly, as an outer covering to the ootheca, to shield its contents from the direct rays of the sun and from the desiccating effects of the hot air. The lather is full of air-bubbles, and at first is sticky, adhering to the fingers like bird-lime, gradually changing to a firm spongy consistency. It is quite tasteless and free from odour. It no doubt protects the ootheca from the depredation of possible foes. I have frequently noticed a small parasitic hymenopteron sitting upon the exterior of the egg-cases, but have never hatched out any from them. A small black ant, however, circumvents the measures taken by the Mantis for the safe protection of its eggs by boring into the egg-case between it and the bough to which it is attached, and robbing it of its eggs and their contents. The ootheca is roughly square in section. The

eggs are arranged in a single layer, four abreast, and are usually about forty in number. The viscid secretion which forms the matrix of the case hardens with remarkable rapidity, so that even a few seconds after the egg is laid it is not possible to dislodge it with the point of a knife. It may be that the lather-like secretion has the function of protecting this fluid from the hardening effects of the atmosphere while the egg is being placed in position.

It may further be noticed that the female uses her cerci which are attached to the last ventral segment, in the manner of a pair of callipers to shape her egg-case and to arrange the lather-like substance in regular parallel rows along its exterior, corresponding in position to some degree, with the rows of eggs within.

The ootheca is finished off at either end with a sort of rostrum formed by a vertical plane of matrix substance projecting in the middle line of the structure. That formed at the commencement of the construction is short and rounded, while that formed at the end of the process is drawn out into a sharp point, as the insect moves away. These rostra are covered with the lather, in the same way as the rest of the ootheca. Each female makes about five of these egg-cases during four or five weeks; a single union with the male appears to suffice for the fertilization of the whole series of eggs laid in the season. The act of forming the egg-case occupies about an hour. The incubation period occupies from forty-four to forty-eight days. The young nymphs in one ootheca hatch out almost simultaneously. The embryos are developed in the egg with their heads pointing towards the free surface of the ootheca, on the side opposite to its attachment to the branch. In some way the embryo softens the end of the cell in which it lies, and this falls outwards as a small disc hanging by a silken thread, and setting the nymph free. At the moment of hatching the nymphs come pouring out of their cells, and hang each by a silken thread suspended in the air; this silken thread is not attached to the cerci, which have not, I think, the function of spinnerets as figured for another species by Brongniart. The thread appears to be a single one of twisted strands, and to be attached at one end to the silk lining of the egg-case, and at the other to a very delicate silk membrane which enfolds the body of the nymph. The nymphs, clad in this membrane, have a distinctly maggot-like appearance.

They soon free themselves from this covering, which remains hanging from the ootheca, and enter upon an independent existence within a quarter of an hour of hatching. At birth they are a tallowy-white colour with the exception of the limbs and prothorax, which are a pinkish-brown colour. This white colour is changed for a brown hue very shortly, about twenty minutes after hatching. The nymphs having freed themselves of their investing membrane at once proceed to climb upwards until they reach the extremity of the branch, where they take up their position for the rest of their pupal existence on the under-side of a leaf or twig. They resemble the full-grown nymph in shape from the moment of hatching, and adopt the inverted position at once. At first they have a hairy appearance, but a lens shows this to be caused by the keel-like expansions and edges and angles of the dorsal and ventral plates, which are relatively exaggerated in the minute nymph.

The nymphs undergo eleven or twelve ecdyses between the date of hatching and the change to the imago stage. The period between ecdyses is, in the early stages, from eighteen to twenty days—and in the later months this period appears to be prolonged to twenty-eight or thirty days. I believe that the nymph effects its escape from the egg-case by the expansion and peristaltic writhings of its abdomen, and not by any hair-like projections of its cerci and limbs as is stated by Trimen in the case of another species. The limbs indeed are twisted up together like a bundle of string, and they and the exoskeleton are quite soft, and could not be used to assist the escape from the egg-case; moreover the nymph is enclosed in a silken shroud, clad in which it emerges from the egg.

The act of ecdysis deserves a short description. The night or early morning is usually chosen for this function, for until it is complete, and perhaps for half-an-hour after, the soft succulent body of the nymph is liable to be seized by one of its comrades, who practise cannibalism for the first few months of free existence, and devour each other readily if a favourable opportunity occurs, or by other foes, spiders, wasps, etc. Before commencing the change the nymph retires to a dark nook behind dense foliage and attaches itself to its support by the terminal claws of all its six legs, which are bunched together, the antennæ are also brought into line with the limbs, and the abdomen is

straightened and curved ventral-wards till it lies beside the limbs; the skin then splits along the dorsal side, and the prothorax emerges as a loop, the head flexed upon the ventral side of the thorax is drawn out followed by the antennæ, and the pairs of legs in serial order; lastly, after the limbs have regained a hold on their support, the terminal extremity of the abdomen is freed. At this stage the insect is quite white, and has a bloated appearance owing to the great size of its abdomen, which is twice that which it will assume later, when curved dorsal-wards; even the eyes are covered by a white film, and only the narrower joints of the legs and the prothorax are coloured a pinkish-brown; after a few minutes the return to the ordinary shape and coloration is effected. The above process is repeated at each moult, and is substantially that which the newly-hatched nymph undergoes when freeing itself from the enveloping egg-membrane. The distention of the abdomen throughout the act, possibly with air, seems to play a very important part in freeing the insect from its discarded skin.

Colour Changes.

At birth the prothoracic disc is relatively small and inconspicuous. It is a greyish-white colour on its ventral aspect, and the central black spot is absent. The azure colour is only fully developed at the seventh moult, five months after hatching, and the purple coloration of the internal aspect of the coxæ, and the purple and black bands on the dorsal surface of the abdomen become well defined about the same period. These colours are however faintly indicated earlier than this, after the second moult. The ground colour of the young nymphs is for the first moult or two a greyish-brown, after this the nymphs are very variously coloured, either light grey, brown, black, pink, or light or dark red. The whole body of the nymph assumes one general colour, the markings observed in the later stages being faintly indicated.

Mr. Shelford, in "Notes on Bornean Mantises," contributed to the "Zoologist," 1903, states that the young of *Hymenopus bicornis* have the power of adopting the colour of their surroundings at the time of moulting; thus they take the colour of a blossom on which they may be sitting. I did not carry out any experiments in this direction with the young of *Gongylus*, but it is very

probable that, as they have the power of producing such a variety of colours, they may also possess that of assimilating their coloration to that of their environment. I hope to be able to test this faculty on a future occasion.

After the fifth month the nymphs remain a light or dark brown, and appear to have lost the power of varying their ground colour. The development of the black spot in the centre of the prothoracic disc is a phenomenon of special interest. As already stated, this is absent at birth. At the first ecdysis, which takes place eighteen days after hatching, it may be noticed that a portion of the pigment around the posterior angle of the disc, on its ventral aspect, becomes separated from the lateral portions, which later disappear. The middle portion, really formed of two dots one on each side of the middle line, is advanced centripetally at each succeeding moult, until at about the sixth moult it reaches the centre of the disc. It retains permanently its angular shape as an indication of its origin. The attractive influence exercised by this intensely black spot for the insects which form the prey of *Gongylus* is enhanced by the total disappearance of all other black pigment from the disc. An interesting comparison may be made in this connection between *Gongylus* and the large African Mantis, *Idolum diabolicum*, which is closely related in form and habits to it. In the latter insect the dark pigment at the posterior margin of the disc is retained throughout life, but there is no central black spot, and this species does not use its prothoracic expansion for the purpose of floral simulation, but has it coloured to resemble the foliage amidst which it conceals itself.

The nymphs at the time of hatching measure from $\frac{9}{16}$ to $\frac{11}{16}$ inch in length, and increase by about one-quarter of their length at each moult. The adult female measures four inches from tip of cephalic crest to the posterior extremity of the abdomen. The young nymphs feed mainly on mosquitoes; they will only take live victims on the wing, and will not touch dead mosquitoes or those seated motionless in their midst. At all stages the Mantis is fond of water, and in captivity will die if this is not sprinkled over it frequently. After the second moult house-flies are eaten, and a month or so later bluebottle flies are captured. When walking and climbing *Gongylus* uses the tarsi of its fore limbs as well as of the two hinder pairs. If the tarsi of the fore limbs are damaged it assists itself by the large tibial claw,

but the main functions of this claw are for the seizure of prey and for defence. The loss of a limb of either of the hinder pairs is repaired at the next moult, but the newly-developed limb is smaller and weaker than the original. The more complex raptorial limbs are not reproduced, although the tibial claw and the tarsus may be. Often a joint or so of the tarsus is missing in the newly-formed limb, but the terminal pair of tarsal claws is always present.

The Development of Sexual Characteristics.

Immediately after the nymph is hatched one notices no distinction between the two sexes. They can be distinguished at this stage by microscopical examination of the terminal ventral plate, the posterior margin of which is deeply notched in the middle line in the female, but straight and uninterrupted in the male. This character persists throughout life.

At the third ecdysis the antennæ in the male are considerably longer than in the female, but in both sexes they remain hair-like, and are curved into a rounded hook at the free end, as in the adult female.

At the ninth moult the male antennæ become greatly thickened for the basal three-quarters of their length, while the remaining quarter is straight and finely tapering. The bi-pectinate form is not assumed until the imago stage. At the fifth moult the female is obviously larger than the male, and this relative size is maintained for the rest of life. About the same time the prothoracic disc of the male assumes its characteristic shape, being smaller, narrower, and more perfectly diamond-shaped than in the female.

Comparison of the habits and mimetic characteristics of Gongylus *with those of* Idolum diabolicum.

This large African species is most closely related to *Gongylus* in its habits and conformation. For a description of the insect the reader is referred to the article by Dr. D. Sharp in Vol. X. of the Proceedings of the Cambridge Philosophical Society, where a coloured sketch of the ventral aspect of the insect is given; this shows that the floral simulation is effected by the petaloid colouring of the inner aspect of the greatly expanded coxæ of the first pair of legs, which is a brilliant purple; and the coxæ are

widely separated, the limbs being extended in front of the head, while the insect maintains a more or less inverted position of the body, with the ventral surface turned towards the light.

The females possess well-developed wings, and have the power of flight. The large prothoracic expansion is coloured a faint green, and has no central black spot; it plays no part in the floral mimicry. Here we see the petaloid colouring, which is confined to the prothoracic disc in *Gongylus*, appearing in another situation, viz. on the coxæ, in *Idolum*, and that in *Gongylus* the purple colouring of the coxæ is utilized for quite a different purpose, to produce a hostile or warning effect. We may remark that *Gongylus* when adopting a hostile attitude not infrequently opens out the several joints of its fore limbs, though not so widely or so far in front of the head as does *Idolum*—and it is worth recalling that Mr. Shelford of the Sarawak Museum, in the paper before referred to, states that many Bornean Mantises so extend their raptorial limbs before seizing their prey. He calls this attitude that they adopt a "warning" attitude. The hostile attitude already described in *Gongylus* is probably deserving of this name, since it evidently seeks by such action to drive off an unwelcome visitor, but the term is not perhaps so well applied to an act in other species which precedes an attempt to seize the prey.

Floral simulation by Mantises appears to have proceeded along two distinct lines. In the majority of species, including some species of the tribe Empusides, the mimicry depends upon the coloration and conformation of the wings and tegmina and of the dorsal aspect of the body, correlated with special attitudes adopted to display these peculiar markings to advantage. Such coloration and modification of form may also be developed in connection with a warning or hostile attitude. A large, winged Mantis, species unknown, found in the Shan States, which has large eye-spots and brilliant colours on its wings, spreads out and displays these when adopting a hostile attitude, perhaps also as a means of attracting its prey, though this has not yet been observed.

The second line of floral simulation is that taken by *Gongylus* and *Idolum*, in which species the ventral aspect is modified in form and colour, chiefly with a view to attraction of prey, while the dorsal surface and wings are

free of conspicuous colours and markings. In all these insects one is struck by the recurrence of the peculiar purple pigment for the production of petaloid colouring in various parts of the body. Dr. Sharp, in the article on *Idolum* already referred to, has some useful remarks on the distribution of this pigment in Mantises. In other Orthoptera a purple or crimson coloration of the wings and other parts of the body is not uncommon, and a similar pigment occurs in other Orders of insects, *e. g.* Hemiptera.

The azure blue pigment of the prothoracic disc in *Gongylus* is probably related to the purple pigment found in other parts of the body, for it tends to change slowly to purple, especially around the margins. One of my Mantises when dying exuded a bead of purplish fluid from its mouth.

I had hoped to find in a study of the life history of *Gongylus* some indication which would throw light upon the peculiar inverted position which it adopts, and for which it is specially modified. No suggestions have however been derived from my investigations. At its exit from the egg the nymph has already the form of the mature insect, and the special coloration is produced as soon as the insect is large enough for it to be of any value in its economy. Many other species may be found occupying temporarily an inverted position when lying in wait for prey, but with the exception of *Gongylus* and *Idolum* I know of none which is specially modified to this end. Fuller information is required as to the habits of many other species than is at present obtainable. The specimens of dried Mantises available for study in our museums give but little indication of the interesting and varied phenomena which the insects exhibit during life.

IX. *New Species of Eastern, Australian and African* Heterocera *in the National Collection.* By Colonel Charles Swinhoe, M.A., F.L.S., etc.

[Read March 2nd, 1904.]

Family AGARISTIDÆ.

Rothia mariæ, nov.

♀. Black, palpi with white spots, thorax below and legs with some ochreous hairs; fore-wings with a discal, oblique, white stripe from the costa a little beyond the middle to the hinder angle, touching neither costa nor angle; hind-wings with a white inner patch occupying the basal half of the costa, narrowing gradually hindwards and ending narrowly rounded, towards the outer margin one-third from the anal angle.

Expanse of wings $2\frac{1}{10}$ inches.

Kampala, Uganda, March 1900 (*H. B. Rattray*).

Family NOCTUIDÆ.

Caradrina albistigma, nov.

♂, ♀. Head, thorax and fore-wings fawn-colour, frons pale ochreous, top of head and collar in the female pale ochreous, fore-wings with the costal line brown, a brown band on the hinder margin, three sinuous, erect, thin brown transverse lines, sub-basal, ante- and post-medial, a brown longitudinal streak (in the female more or less macular) cut in two by the large, almost square reniform white stigma which reaches up to the costa; hind-wings and abdomen pale black, anal tuft of male ochreous.

Expanse of wings $1\frac{2}{10}$ inches.

2 ♂, Sandakan (*W. B. Pryer*). 1 ♀, Matang, 1800′, May 1902 (*R. Shelford*).

Agrophila labuana, nov.

♂. Antennæ, palpi and legs ochreous, head, body and wings sordid white, head, front of thorax and anal tuft of abdomen slightly suffused with ochreous, head and thorax with some black dots, fore-

wings with the costa narrowly and the outer margin broadly grey, two black dots at one-third from base, near costa and near hinder margin, a brown upright band across the centre, narrow in its middle, widened on costa and on hinder margin; an outwardly curved pale brown discal line, composed of pale brownish minute marks, containing a blackish dot below the costa and two towards hinder margin, the outer marginal grey portion includes two brownish bands, marginal and submarginal, cilia with grey tips; hind-wings without markings, but slightly tinged with grey on the outer portions.

Expanse of wings $\frac{6}{10}$ inch.

Labuan, Borneo.

Somewhat resembling *Tarache erecta*, Moore, from India.

EUBLEMMA VESTINA, nov.

♀. White, upper-side of palpi and the antennæ chestnut-brown, fore-wings with a few blackish-brown markings, two indistinct marks near the base below the costa, three short bands from the costa to the median vein, ante-medial, medial and post-medial, at even distances apart and rather close together, the medial band ending in a brown ringlet, representing the reniform, the orbicular a mere dot, all the bands having more or less indistinct traces of completion on the hinder margin, a little blackish suffusion on the costa before the apex and on the outer margin below the apex and a marginal row of blackish dots; hind-wings with a brown spot in the middle of the abdominal margin, a very indistinct greyish line close to the inner margin and a marginal grey line; under-side pure white with apices of the fore-wings suffused with pale black.

Expanse of wings $\frac{6}{10}$ inch.

Labuan, Borneo.

Resembling in shape *E. cretacea*, Hmpsn., from Ceylon.

CAREA ANNÆ, nov.

♀. Palpi white, brown above, antennæ, head, thorax and fore-wings pale chestnut-red, the tips of the hairs of the thoracal crest dark brown; fore-wings striated with grey, some brown dots near the base and one at the end of the cell, a grey round patch in the centre of the wing and two waved greyish transverse faciæ ante- and post-medial, abdomen and hind-wings paler and with a pinkish tinge, but without markings; under-side white; legs with

brown stripes and brown tarsi, wings with a pink tinge, fore-wings with a costal row of white spots ; hind-wings striated with brown.

Expanse of wings $1\frac{7}{16}$ inches.

1 ♀, Kuching, Borneo, May 1899 (*R. Shelford*).

CAREA MATHILDA, nov.

♂. Palpi and head chestnut tinged with ochreous, last joint of palpi brown ; thorax and fore-wings chocolate-brown, a brown dot at the end of the cell, and two nearly straight, thick, oblique brown lines, the first from the costal third to hinder margin beyond the middle, the other from the costa beyond the middle, to the hinder margin close to the angle, cilia and hinder marginal line brown ; abdomen and hind-wings blackish-brown, without markings, cilia pale pinkish, as is also the anal tuft, the sides of the abdomen and the whole body and wings beneath, fore-wings with some brown suffusion in the interior part, cilia brown.

Expanse of wings $1\frac{1}{2}$ inches.

1 ♂, Matang, Borneo, 1800′, May 1902 (*R. Shelford*).

PLATYJA RUFISCRIPTA, nov.

♀. Dark chocolate-brown, tinted with chestnut-brown and suffused and marked in parts with pale red-brown and ochreous ; palpi pale, tinged with ochreous, fore-wings with the middle and lower central space pale, tinged with ochreous, containing a brown dot in the cell, and a most curiously curved sinuous line, dentate in parts, commencing on the hinder margin beyond the middle, curved round outwardly above the middle, almost down to the hinder angle, then up alongside the straight submarginal brown line (which crosses both wings) and then bent in on to the costa one-fourth from apex, there is an antemedial oblique thin line, which limits the darker portion of the wing ; on the hind-wings there is a pale ochreous tinged space on the margin outside the submarginal straight line ; the under-side is purplish-brown, uniformly tinged with chocolate and is without markings except for a thin crenulated pale line which crosses the middle of both wings.

Expanse of wings $2\frac{3}{16}$ inches.

1 ♀, Paku, Sarawak, April 1899 (*R. Shelford*). 1 ♀, Singapore (*H. N. Ridley*). 1 ♀, Singapore (*Moore coll.*).

The last-mentioned has much less ochreous on it than the others.

GRAMMODES PULCHERRIMA.

Grammodes pulcherrima, Lucas, Proc. Linn. Soc. N.S.W. (2) vii, p. 258 (1892).
Grammodes clementi, Swinhoe, Ann. Mag. N. H. (7) viii, p. 133 (1901).

Raebourne, Brisbane.

Mr. A. J. Turner of Brisbane, to whom I sent some of my Australian species, informs me that the above two are identical.

Genus VESTURA, nov.

Frons flat, proboscis present, palpi upturned, thickening upwards, ending in three bushy tufts of hairs to each palpus, hiding third joint which is thick, well clothed and twice as long as the second; the second is also hairy with short bunches of hair; antennæ ciliated and slightly distorted with a peculiar curve at one-third from base; wings shaped much as in Episparis, venation much the same.

VESTURA ADEBA, nov.

♂. Dark chocolate-brown, frons pale, palpi with some ochreous hairs, fore-wings with a white dot forming the orbicular, a large somewhat square-shaped reniform stigma; basal, sub-basal and medial, outwardly curved and sinuous ochreous lines, the last ending in a white spot on the costa of fore-wings, a discal (almost submarginal) distorted similar line, the inner edgings of which are broadly black, marginal lunules black, marginal line ochreous, a small white dot in the cell; under-side pale chocolate colour, a black antemedial fascia, a central ochreous line as above and some dark black markings on the disc of the hind-wings.

Expanse of wings $1\frac{5}{10}$ inches.

2 ♂, Singapore (*Ridley*) (type). 5 ♂, Sandakan, Borneo (*W. B. Pryer*). 1 ♂, Kuching, Borneo, December 1901 (*R. Shelford*).

PSEUDAGLOSSA SHELFORDI, nov.

♂. Brown with a pink tinge, frons with large brown hairs, thorax with a large tuft of brown hairs in front, abdomen with a crest on each segment except the last two and with a large anal tuft; fore-wings with a band of ten black spots near the base, a broad central blackish band, a narrow pinkish band running through the reniform

and including it, some black dots in the reniform, a black angular patch on the costa before the apex, a pale patch beneath, touching the hinder margin and two similar, but much smaller patches near the outer margin, the whole outer space between the patches is pinkish, the outer margin being suffused with brown ; hind-wings with the basal third black, then a medial pinkish band and the remainder of the wing blackish-brown, central space pale.

Expanse of wings $1\frac{3}{10}$ inches.

3 ♂, Kuching, Borneo, June 1900 (*R. Shelford*). 2 ♂, Pulo Laut (*Doherty*).

BOCANA MADIDA, nov.

♂. Brown ; fore-wings with a brown sub-basal spot, a brown oblique band before the middle, a white dot at the end of the cell, a sub-marginal line of pale lunules with black outer edging ; hind-wings with an inner brown band which includes a white dot at the end of the cell, medial and discal sinuous and more or less dentate bands with black inner edgings ; marginal line to both wings lunular and black, cilia dull ochreous.

Expanse of wings 1 inch.

1 ♂, Kuching, October 1900 (*R. Shelford*).

It is not a typical Bocana, the antennæ have a kink in the middle, from which proceeds a tuft of pale hairs, the palpi is disjointed in the middle, the upper half consisting of a thick club bent acutely backwards and has a comb of thick hair on its upper-side, but I cannot diagnose this genus properly with only a single example to work on.

RHÆSENA APICALIS, nov.

♂. Head, thorax and fore-wings dark grey, palpi white at the tips, head and sides of the thorax marked with white, a black dot at the end of the cell, some brown suffusion at the base of the wing, a black straight band from the costa a little beyond the middle to the hinder angle, the space beyond blackish-brown, a sinuous pale line with black inner edging runs from near the middle of the black band to the costa near the apex, the marginal space beyond this is grey, the marginal line black and contains a black patch in the middle; abdomen and hind-wings blackish-brown without markings.

Expanse of wings $\frac{9}{10}$ inch.

1 ♂, Paku, Borneo, April 1899 (*R. Shelford*).

Family LYMANTRIIDÆ.

Genus Stracena, Swinh., Trans. Ent. Soc., 1893, p. 388.

Stracena fuscivena.

Stracena fuscivena, Swinh., l. c.

1 ♂, Ashanti. 4 ♀, Sapele, River Niger, including the type. 1 ♀, Old Calabar.

The male has the thorax and fore-wings darker than the female and more purplish-grey, the hind-wings are white as in the female, the veins in both wings prominent and better clothed than in the female, the wings below are white, the fore-wings with grey apical patch and some grey suffusion, narrowly on the outer margin, the abdomen has three rings at the anal end above.

Expanse of wings $1\frac{8}{10}$ inches.

Euproctis lyclene, nov.

♀. Pure white, frons with some grey hairs, legs striped with grey, fore-wings with a black spot at the end of the cell, followed by a black line, elbowed outwardly in its middle, extending from costa near apex to the hinder margin a little beyond the middle, where it ends in a small black spot, and is followed by an outwardly oblique, very short black line ; no other markings ; under-side pure white without any markings.

Expanse of wings $\frac{9}{10}$ inch.

Kuching, Borneo, May 1900 (*R. Shelford*).

Dasychira hieroglyphica, nov.

♀. Head ochreous-grey, body and wings dark brown, fore-wings with a brown mark above the hinder margin near the base, a large dull green space in the middle of the wing, marked with white and limited by a black line with white edgings, running down in dentated form from the costa one-fifth from apex to the hinder margin a little beyond the middle, then curved and runs upwards, sinuous but without teeth to near the costa, then bends inwards and on to the costa a fifth from the base, there are some brown marks in this patch, and a whitish space on the inner-side of it ; an indistinct, submarginal sinuous line, black marginal lunules marked outwardly with whitish-ochreous, and a line of that colour at the base of the blackish-brown cilia, also three or four black streaks inwardly from the margin ; hind-wings without marks, but with a whitish-ochreous

line at the base of the cilia: under-side greyish-ochreous, with discal bands on the wings, cell-spots, and two or three discal spots.

Expanse of wings $1\frac{8}{10}$ inches.

1 ♀, Ashanti, Obuassi (*Bergman*).

Of the shape of *D. goodi*, Holland, but the abdomen has no crests.

DASYCHIRA LIBELLA, nov.

♂. Pectus ochreous, palpi with ochreous and brown hairs, antennæ brown, head and collar white with some brown hairs, thorax and fore-wings greyish-white with brownish-grey irroration, packed in parts forming a thin antemedial band and a broad medial fascia, with a thick blackish line in it near its inner limit, and a similar outer line, more or less sinuous and curved outwards above the middle and then straight to the costa at one-fourth from the apex, the curved portion toothed, a similar paler grey line just outside it, and indications of a sub-marginal similar line; hind-wings white, unmarked, abdomen grey; under-side whitish, wings nearly pure white without markings, except for a pale grey linear mark at the end of the cell.

Expanse of wings $1\frac{4}{10}$ inches.

1 ♂, Ashanti, Obuassi (*Bergman*).

Abdomen with crests.

DASYCHIRA BERGMANNII, nov.

♂. Palpi black above, ochreous beneath, antennæ brown, a white spot on each side below the base of the shafts, head, thorax and fore-wings dull olive-green, fore-wings with a somewhat ear-shaped brownish stigma at the end of the cell, the wing sparsely irrorated with brown atoms, and with apparently eight very indistinct transverse fasciæ some of which, more especially on the outer portions of the wings, include indistinct dentated white and brown transverse lines, marginal line blackish-brown, cilia dull ochreous, with a grey medial line and blackish-brown patches at the tips; hind-wings pale dull ochreous-brown, abdomen of same colour with blackish-brown tufts; under-side pale greyish-ochreous, without markings except for a lunular grey mark at the end of the fore-wings and brown patches on the cilia.

Expanse of wings $2\frac{3}{10}$ inches.

1 ♂, Ashanti, Obuassi (*Bergman*).

Allied to *D. gnava*, Swinh., and *D. vires*, Druce.

DASYCHIRA ILA, nov.

♂. Antennæ ochreous, shafts brown, top of head white, thorax and fore-wings grey, covered with very minute darker grey irrorations, and crossed by six sinuous bands of thin lunules formed by brown irrorations, two apparently near the base, antemedial, medial (ending in a cell lunule and spot), discal (curving outwards) and submarginal, the last composed mostly of blurred spots, some of them duplicate; cilia also with duplicate spots; hind-wings and abdomen white; under-side pure white, without markings.

Expanse of wings $1\frac{4}{10}$ inches.

2 ♂, Ashanti, Obuassi (*Bergman*).

Abdomen with crests.

Genus HETERONYGMIA, Holland, Psyche, vi, p. 414 (1893).

HETERONYGMIA MANICATA.

Lymantria manicata, Auriv., Ent. Tidsk., xiii, p. 193, ♀ (1892).

„ „ Swinh., Trans. Ent. Soc., 1903, p. 489.

Heteronygmia rhodapicata, Holland, l. c., p. 416, pl. 10, f. 15.

1 ♂, Ogave River (*Holland*). 1 ♂, 1 ♀, Ashanti. 1 ♀, Sapele, River Niger. 2 ♀, Old Calabar.

The receipt of both sexes from the same locality induced a careful examination of their structural characters, leaving no doubt of the identity of the species.

Genus LOMADONTA, Holland, Psyche, vi, p. 417 (1893).

LOMADONTA OBSCURA, nov.

♂. Brown with a slight ochreous tinge, palpi with some ochreous hairs; fore-wings with the costa dark brown, a patch on the costa near the apex a little darker than the ground-colour, a transverse medial brown band or fascia stopping short of the costa and the inner portion of the wing rather darker than the outer, an indistinct discal transverse sinuous pale line, a similar sub-marginal line with some small blackish lunular marks on it, marginal line dark brown; hind-wings paler than the fore-wings and without markings; underside whitish with a discal brown line across both wings; ♀ much paler than the male, uniform in coloration, with the male marks faintly traceable.

Expanse of wings ♂ $1\frac{3}{10}$, ♀ $1\frac{4}{10}$ inches.

♂, Ashanti, Obuassi (*Bergman*). ♀, W. Africa (*Saunders' coll.*).

Differs from the only two other known species of this genus, *erythrina*, Holland, and *johnstoni*, Swinh., in having a small excavation on the outer margin immediately below the apex in both sexes.

LOMADONTA SATURATA, nov.

♂. Head, thorax and fore-wings dark chocolate-brown, fore-wings with a dark brown sinuous line from costa beyond the middle to hinder margin beyond the middle, then it immediately curves round and runs up again to the costa near the apex, abdomen and hind-wings brown without any markings, thorax white, legs brown, wings uniform in colour, paler than above, costa of fore-wings and the whole of the hind-wings tinged with crimson, the latter with a black spot at the end of the cell, a discal and a sub-marginal sinuous line.

♀. Paler, more chocolate above, more crimson below, markings similar.

Expanse of wings, ♂ $1\frac{8}{10}$, ♀ $1\frac{6}{10}$ inches.

♂, ♀, River Niger, Sapele (*Sampson*).

Family AGANAIDÆ.

Subfamily *DEILEMERINÆ.*

DEILEMERA RATTRAYI, nov.

♂, ♀. Palpi bright ochreous below, with some brown marks, dark brown above and on the third joints, antennæ black, frons ochreous, head black, thorax brown, ochreous spots in front, two white stripes down each side, abdomen white with blackish segmental dorsal and lateral spots, tip ochreous, wings semi-hyaline, fore-wings pale reddish-brown the interior portion very thinly clothed and consequently much paler than the rest of the wing; hind-wings white, with a narrow red-brown outer marginal border thickened at the apex, cilia of both wings with dark brown marks; in some examples the band on the hind-wings is merely macular except at the apex.

Expanse of wings $1\frac{4}{10}$ inches.

Kampala, Uganda, February 1903 (*H. B. Rattray*).

Male with normal hind-legs; belongs to my Section II, D, Trans. Ent. Soc., 1903, p. 55.

Genus Xylecata, nov.

Palpi rather long, first and second joints more than twice as long as the third, upturned, third joint depressed, antennæ of the male pectinated to the tips, of medium length, of the female nearly simple, with minute serrations, hind tibiæ with two pairs of short spurs of even length, tarsi short; fore-wings with vein 2 from a little beyond middle of cell, 3 from before end, 4 and 5 from the lower end, 5 much bent, 6 from upper end, 9 from 8 near apex, 8 and 10 from a long areole, 11 from a little before upper end of cell, 12 free; hind-wings with veins 2, 3, 4 and 5 as in fore-wings, the origin of 5 being a little above that of 4; 6 and 7 stalked.

Xylecata druna, nov.

♂, ♀. Palpi yellow, last joint black, antennæ black with a white line along the shaft, frons white with a black spot; a white spot at the base of each antenna, collar ochreous, head white with a black spot, thorax white with two black spots in front and black stripes, abdomen white with black segmental bands and ochreous tip; wings white with broad marginal black borders, the costa of fore-wings narrowly black, the outer border occupies fully one-third, the white portion curving rather irregularly into the border, hind-wings with a narrower and fairly uniform border; some grey shades and streaks at the base of both wings and along the hinder margin of fore-wings.

Expanse of wings $1\frac{7}{10}$ inches.

2 ♂, 2 ♀, Gaboon (*Crowley Bequest*).

Xylecata simplex.

Nyctemera simplex, Walker, Proc. N. H. Soc. Glasg., i, p. 330 (1869).

1 ♀, Congo (type).

Genus Geodena, Walker, vii, 1691 (1856).

Geodena quadrigutta.

Geodena quadrigutta, Walker, vii, 1691 ♂.
Geodena marginalis, Walker, vii, 1691 ♀.
Cypra bimaculata, Walker, xxxii, 399 (1865).

1 ♂, 2 ♀, Sierra Leone (*Walker's* types). 1 ♂, 1 ♀, River Niger, between Akasa and Asaba (*Lugard*).

GEODENA SEMIHYALINA, nov.

♂. Antennæ black, shafts ochreous, palpi, frons, head, body and legs ochreous, wings white, very thinly clothed, a large brown spot at the end of each cell; on the under-side there is some ochreous suffusion on the costa of fore-wings and near the base of both wings.

Expanse of wings $1\frac{1}{2}$ inches.

Sierra Leone (*Crowley Bequest*).

Wings broader than in the type species of the genus.

GEODENA BANDAJOMA, nov.

♀. Antennæ black, palpi black above, ochreous beneath, frons, head and thorax ochreous, abdomen whitish, wings white, veins grey and rather prominent, fore-wings with a pale black costal band, and more than the outer third of the wing pale black, almost grey, the excavation of the white into the black is toothed at its upper part and rather more angled than usual in the middle, there is some grey suffusion at the base and along the hinder margin; hind-wings with a narrow marginal band of very pale black, attenuated at the middle.

Expanse of wings $1\frac{6}{10}$ inches.

1 ♀, Bandajoma, Sierra Leone (*Arnold*).

GEODENA ACCRA, nov.

♀. Antennæ and palpi black, frons and top of head white, collar bright orange-ochreous, followed by a black band, body white, wings white, fore-wings with a thin black band on the costa, the outer half of the wing deep black, the white portion curving into it evenly, the black being produced inwardly on the hinder margin to a point; hind-wing with a large deep black apical patch with a black line running down for a short distance on the outer margin.

Expanse of wings $1\frac{1}{2}$ inches.

1 ♀, Accra (*Crowley Bequest*). 1 ♀, Old Calabar.

GEODENA FUNESTA.

Hylemera funesta, Warr., Nov. Zool., vi, p. 304 (1899).

1 ♂, Kampala, Uganda, April 1900 (*H. B. Rattray*).

The type from Port Alice is in coll. Rothschild.

Hylemera ansorgei, Warr., and *discinota*, Warr., p. 303, belong to the same genus; they are however not in the B. M.

Geodena suffusa, nov.

♂. Antennæ black, shafts brown, palpi above and the last joint black, palpi below, frons, head and thorax ochreous, abdomen grey tinged with ochreous, wings greyish-white tinged with ochreous, the fore-wings less ochreous than the hind-wings and tinged with pale purplish, a large black spot at the end of the cell of fore-wings and a smaller spot at the end of the cell on hind-wings; outer border of hind-wings with indications of a pale greyish band; under-side more ochreous, the hind-wings much suffused with that colour.

Expanse of wings $1\frac{4}{10}$ inches.

River Niger, Sapele (*Sampson*).
Wings shaped as in *G. quadriguttata*.

Geodena inferma, nov.

♂. Antennæ black, palpi black above, ochreous beneath, frons ochreous with a large black spot nearly filling it up, top of head and thorax ochreous (much denuded), abdomen whitish with black segmental bands, wings white, fore-wings with the costal line and the outer half of the wings black, the white recurved into the black rather deeply and a white sub-costal elongate spot towards the apex; hind-wings with an apical black band which is continued in the form of two or three small spots on the lower half of the outer margin.

Expanse of wings $1\frac{1}{2}$ inches.

1 ♂, Ambriz, Portuguese West Africa (*Montiero*).

Geodena partita, nov.

♂. Antennæ, palpi above and head black, palpi below, collar and thorax in front orange-ochreous, rest of thorax and abdomen white, wings white, fore-wings with more than half the outer portion black, the limit of the white part almost evenly rounded outwards; the black running along the costa towards the base; hind-wings with a black spot at the end of the cell, and with a black marginal band gradually attenuated hindwards; under-side, body ochreous, legs mostly black but with some ochreous marks.

Expanse of wings $1\frac{4}{10}$ inches.

Ashanti, Obuassi, 150 miles inland (*Bergman*).

Geodena surrendra, nov.

♀. Antennæ, palpi and frons black, head ochreous, collar black, thorax and abdomen ochreous suffused with pale black, wings white

with a good deal of blackish suffusion especially on the basal and hinder marginal portions of the fore-wings; these have the costal band rather broader than usual and almost two-thirds of the wing pale black; the white portion regularly curved into the black but very limited in its space, there is also a long oblique white patch towards the apex; hind-wings with a narrow pale black marginal band, the white curving into it in its centre and making it very narrow.

Expanse of wings 1½ inches.

1 ♀, Gold Coast, Aburi, August 1901 (*W. H. Johnson*).

GEODENA NOTATA.

Girpa notata, Holland, Ent. News, Philad., 1893, p. 60, pl. 3, f. 3.

1 ♂, Ogave River (*Holland*).

GEODENA ABSIMILIS.

Geodena absimilis, Holland, Ent. News, Philad., 1893, p. 61, pl. 3, f. 5.

1 ♂, Ogave River (*Holland*).

Subfamily *CALLIMORPHINÆ*.

CALLIMORPHA COCCINEA, nov.

♂. Head and body above and below bright scarlet-crimson, four black spots in a row behind the collar, and black spots on the abdomen, dorsal and lateral, palpi with the last joint black; antennæ black; fore-wings dark purplish-grey, crimson at the base, two very large dull ochreous spots one touching the costa beyond the middle, the other just below it, touching the hinder margin, its lower half crimson; hind-wings whitish tinged with crimson, the abdominal margin broadly crimson, the outer margin with a broad band coloured like the fore-wings, all the veins pale on the dark portions of both wings; under-side, legs grey, abdomen with a middle row of black spots; wings as above but paler, an elongated grey spot inside the end of the cell of hind-wings and a smaller similar spot outside it and a small dot on the internal vein.

Expanse of wings 2 $\frac{2}{16}$ inches.

1 ♂, Kuching, Sarawak, February 1903 (*R. Shelford*).

Family EUPTEROTIDÆ.

EUPTEROTE JARESIA, nov.

♂. Antennæ ochreous-brown, shafts white, palpi and frons reddish-ochreous, body and wings pale ochreous-grey, many pale reddish-brown crenulated bands across both wings; across the disc is a duplicate thin brownish band, and between this and the outer margin there is a dentate thick line of the same colour, which is accompanied on the fore-wings by two or three large brownish spots; under-side same as above, but slightly paler, legs with brown spots on the joints and at the ends of the tarsi.

Expanse of wings $2\frac{3}{4}$ inches.

Salayer Isl., Celebes.

The above is the measurement of the type specimen; I have in my own collection four examples of this form from the same locality, some more yellow in colour and varying in size, the smallest measuring only $2\frac{2}{10}$ inches.

Family NOTODONTIDÆ.

SOMERA OXOIA, nov.

♂. With the ground-colour of the antennæ, head, thorax and fore-wings pale ochreous fawn-colour, palpi brown above and at the sides, thorax with a brown band in front, fore-wings marked in many places along the costa and at the base and centre with dark brown spots, the orbicular represented by a very large almost square white stigma, the outer margin suffused with brown, and with two bands of whitish lunular marks, abdomen and hind-wings dull red, without markings, under-side dull red at the sides and legs, the latter with whitish knees and whitish rings on tarsi; fore-wings dull red, hind-wings whitish, no markings.

Expanse of wings $2\frac{1}{10}$ inches.

1 ♂, Kuching, Borneo, July 1897 (*R. Shelford*).

Family LASIOCAMPIDÆ.

ARGUDA ERECTILINEA, nov.

♂. Of a bright ochreous-red colour; abdomen whitish at the sides; fore-wings with a white spot at the end of the cell, an indistinct thin grey ante-medial transverse line and an erect duplex straight post-medial line with a white centre, the outer space pale and tinged with grey, hind-wings whitish towards the base, dark red-brown in the disc, pale grey at the outer margin; under-side with

the whole space on the fore-wings up to the post-medial line whitish, the outer portion and the hind-wings suffused with purplish-pink, abdominal margin pale.

Expanse of wings $1\frac{5}{16}$ inches.

1 ♂, Singapore (*H. N. Ridley*) (type). 1 ♂, Sarawak (*R. Shelford*).

Family LIMACODIDÆ.

Contheyla lola, nov.

♂. Head, body and the basal half of fore-wings chestnut-brown, this colour on the wings limited by a pale oblique band of pale spots with grey centres and this band is followed on the outer margin by a pale grey band; hind-wings chestnut-brown; a pale ochreous marginal line to both wings and ochreous cilia, interlined with grey; under-side body and legs chestnut-brown, wings much paler than they are above, tinged with grey and without markings.

Expanse of wings $\frac{5}{16}$ inch.

Kuching, Borneo, September 1900 (*R. Shelford*).

Contheyla brunnea, nov.

♂. Dark olive-brown, palpi whitish at the tips, fore-wings densely irrorated with black atoms except on the costal and outer border where the wings are paler and slightly ochreous, hind-wings blackish, outer marginal border pale and ochreous; under-side paler, the fore-wings have all the borders ochreous, the centre portion black in the form of a long triangle; hind-wings pale brown, outer border broadly ochreous; no markings above or below.

Expanse of wing $\frac{5}{16}$ inch.

Sarawak.

Thosea peralbida, nov.

♀. Pure white, palpi with some black hairs at the base, fore-legs with grey stripes, thorax with a broad grey longitudinal stripe in the middle, abdomen with a blackish diffused middle stripe below, and one on each side and around the under-side of the ochreous anal tuft, fore-wings with a broad grey band at the base, leaving a small white space on the hinder margin close to the base, some slight grey suffusion along the costa and some grey speckles on the costal margin, a small grey patch below the costa near the apex.

Expanse of wings 1 inch.

Poona.

Unlike any other species of the genus known to me.

Birthama basibrunnea, nov.

♂. Antennæ pale chestnut-colour, palpi, head, body and nearly the basal half of the fore-wings rich dark brown, palpi with the tips and base ochreous, top of head also ochreous, the basal brown portion of the fore-wings limited by an ochreous line, which is outwardly curved and has two indentations, one above and the other below the middle, the outer portion of the wing is pale pinkish-brown, with brown irrorations; a submarginal row of brown dots, inwardly edged with whitish, a grey thin band close to the margin, a marginal grey band, and grey tips to the cilia; hind-wings whitish, outer margin and cilia tinged with grey; under-side, wings whitish with some brown suffusion in their centres, brown marginal and sub-marginal lines on both wings, body and legs dark rich chestnut-brown.

Expanse of wings 1 inch.

Dar-es-Salaam, German East Africa.

Is more of the shape of a *Miresa*, but has vein 7 of the fore-wings from the upper angle of the cell, 8, 9 and 10 stalked.

Family ZYGÆNIDÆ.

Genus Pteroceropsis, nov.

♂. Proboscis present, palpi upturned very minute, frons rounded and prominent, antennæ with the outer half much thickened and curved, unipectinate on the lower half, the pectinations very short at the base, increasing in length gradually towards the middle, the upper half bipectinate, the pectinations long on one side, and thickened and clubbed with setæ forming a massive plume; fore-wings with all the veins from the cell; hind-wings with veins 6 and 7 parallel and close together, 7 a long distance from 8 and joined to it by a bar.

Pteroceropsis unipuncta, nov.

♂, ♀. Palpi, head, antennæ, body and fore-wings black, some glistening blue scales on the antennal plume and on the frons, two transverse bands of the same colour on the fore-wings, basal and ante-medial, a largish white spot at the end of the cell and a blue spot below it, hind-wings hyaline with black borders, the outer marginal border occupying one-third of the wing; under-side with a broad ochreous band on the centre of the abdomen; the fore-wings of the male with a broad ochreous stripe above and close to the hinder margin, absent in the female.

Expanse of wings, ♂ 1⅛, ♀ 1 inch.

♂, ♀, Kuching, May 1901 (types). ♀, Kuching, August 1899 (*R. Shelford*). ♂, Sandakan, Borneo (*W. B. Pryer*).

The Sandakan male is as large as the females.

CHALCOSIA VIRIDISUFFUSA, nov.

♀. Antennæ and upper part of frons black, lower part of frons glistening blue, top of head and collar crimson, body and fore-wings nearly black, suffused with green, some bright blue scales on the edges of the divisions of the thorax, fore-wings with the veins pale, and with a broad white even band across the disc from costa a little beyond the middle to hinder margin at three-fourths, hind-wings white, basal fourth suffused with dark dull green, outer margin broadly black, tinged with green, the band gradually fining to a point before the anal angle; under-side, body and legs dull black, without markings, wings as above but the basal portion shot with steel-blue, all the veins pale and distinct and both wings with a pale blue grey band close to the outer margins.

Expanse of wings $2\frac{2}{10}$ inches.

Matang, Sarawak, August 1899 (*R. Shelford*).

Family CALLIDULIDÆ.

Genus AGONIS, Feld., Reise Nov., p. 107 (1868).

AGONIS DYMUS, nov.

♂. Rich chocolate-brown, very uniform in colour, fore-wings with the costal line dark brown with many minute white dots, no other markings above, cilia of both wings with the tips ochreous; below paler, tinged with ochreous, fore-wings with the costal line as above, a row of seven white dots from the base through the cell; 1st basal, 2nd near it, 3rd in the middle of the cell with two very minute dots above it, 4th, 5th and 6th close together inside an angular brown mark at the end of the cell, 7th half-way between it and the outer margin, with two or three dots above it, all the dots ringed with brown, hind-wings striated with chocolate-brown, with a dark red-brown central band, containing several white dots in clusters all ringed with brown, and three on the inner side in a row, and several smaller ones in the disc.

Expanse of wings $1\frac{2}{10}$ inches.

Fergusson Isl., several examples.

On the upper-side somewhat similar to *A. lycænoides*, Felder, but the wings are longer and it is quite different on the under-side.

Family PYRALIDÆ.

Niphostola punctata, nov.

♂. White, palpi brown on the inner sides, fore-wings with some pale ochreous-grey suffusion in the disc and along the hinder border, two small brown spots placed obliquely before the middle and a larger black spot at the end of the cell, a small black spot at the apex and some grey dots on the outer margin; hind-wings with some ochreous-grey suffusion; under-side, fore-wings ochreous-grey, except on the margins.

Expanse of wings $\frac{9}{10}$ inch.

1 ♂, Santubong, May 1902 (*R. Shelford*).

Stenia hieralis, nov.

♂. Pale chocolate-brown, fore-wings with a white spot, marked with brown on each side, at the end of the cell; another white spot on the outer margin, close to the apex; a white transverse line edged inwardly with brown, before the middle; another in the disc, rather close to the outer margin, commencing with a white mark on the costa near the apex, nearly straight down for two-thirds, then curving round, touching the outer margin, then well inwards for one-third and then straight down to the hinder margin; hind-wings, with two nearly straight similarly coloured lines; marginal line on both wings brown, cilia white with brown tips.

Expanse of wings $\frac{7}{10}$ inch.

1 ♂, Sarawak (*R. Shelford*).

Bradina opacusalis, nov.

♂. Blackish-brown, palpi white beneath, abdomen with whitish segmental lines and thin bands, fore-wings with an indistinct dark spot in the cell and another at the end, both wings with a pale ochreous marginal line; under-side paler, fore-wings with the hinder marginal space whitish, no markings.

Expanse of wings 1 inch.

1 ♂, Kuching, Borneo, December 1900 (*R. Shelford*).

Xanthomelaina quinquepuncta, nov.

♂. Pale yellow, last joint of the palpi white, wings semi-hyaline, fore-wings with three large black spots in the shape of a triangle, one below the middle of the costa, the other two above the hinder

margin, one sub-basal, the other near the hinder angle ; hind-wings with two similar spots, one near the anal angle and the other touching the outer margin, near the apex.

Expanse of wings $\frac{8}{10}$ inch.

1 ♂, Kuching, Borneo, January 1899 (*R. Shelford*).

The wings narrower than in *X. schematias*, Meyrick, from Pulo Laut and Tambora, which is also a yellow insect of much the same shade of colour, with six spots on the fore- and two on the hind-wing.

MARGARONIA AMICALIS, nov.

♂. Body and fore-wings pale chocolate-brown, head and stripes on the thorax whitish, fore-wings with two broad white hyaline bands, somewhat as in *M. stolalis*, Guen., but the medial band is broader and more uniform in width and the outer band is equally as broad on the costa and curves suddenly to a point a little below vein 3, both bands edged with dark chocolate-brown, between the first band and the base is a small pale thin band in the middle space, and between the two bands is a similar mark at the end of the cell, both edged with chocolate-brown ; on the hind-wings below the first band of the fore-wings is a very broad white hyaline band, which gradually narrows hindwards and is limited on its outer-side by a duplex chocolate-brown band which runs across the disc of both wings, marginal line of both wings brown, cilia white.

Expanse of wings $1\frac{1}{2}$ inches.

Dar-es-Salaam.

Belongs to the *stolalis* group.

MARGARONIA CLEONADALIS, nov.

♂. Brown, frons with some white scales, head with a white line on each side, some white hairs on the thorax and the abdomen with a white tip ; fore-wings with the costa pale ochreous, a white lunular semi-hyaline mark below the middle of it, a short semi-hyaline white band touching the costa at one-fifth from apex and a dot below it, all the white marks lined with brown and a brown band extends from the last, straight across the disc and across the centre of the hind-wing, a small white space at the anal angle and the cilia of both wings white.

Expanse of wings $\frac{9}{10}$ inch.

1 ♂, Paku, December 1898 (*R. Shelford*).

Leucinodes labefactalis, nov.

♂. Dull white, antennæ, palpi above and top of head and thorax brown, abdomen with a brown patch at the base and another in the middle; wings semi-diaphanous, fore-wings with the costa, outer margin and the lower half of the wing from the outer margin near the hinder angle to the costa one-third from base opaque white, a chestnut-brown patch near the base and another at one-third, touching the hinder margin, the opaque part extends upwards in the centre in the form of a thin band and joins the costa at the middle, there is a very thin, sinuous transverse brown line in the disc and another sub-marginal; hind-wings with a space at the base and all the margins opaque, a chestnut-brown band with some hyaline spots in it before the middle, a brown patch at the anal angle, and a brown outer line limiting the hyaline space.

Expanse of wings $\frac{9}{10}$ inch.

1 ♂, Kuching, June 1900 (*R. Shelford*).

April 27th, 1904.

X. *A Catalogue of the* Lepidoptera Rhopalocera *of Trinidad.* By William James Kaye, F.E.S. *With an Appendix by* J. Guppy.

[Read November 4th, 1903.]

Plates XVII and XVIII.

The Catalogue now submitted is intended as a companion to the Preliminary Catalogue of the Lepidoptera Heterocera published in the Transactions for 1901. There is a considerable difference between the two, as the one now offered is much more nearly a complete list. In it, as many as 289 species are enumerated, which for an island 60 miles by 40 is probably unequalled. A few of the number will doubtless have to be expunged, as errors of determination in the first instance, but their places will probably be more than filled when the last word has been said as to what does really occur. The only thing of any sort that has been published relative to the Butterflies of Trinidad is the bare list of names by W. M. Crowfoot in "The Trinidad Field Naturalists' Club" for April 1893. In that list are 199 names, several of which appear to be errors of determination, but in nearly every case I have weighed the merits of each record, before inserting it in the present Catalogue, and have indicated the probable errors. The basis of the New List is my own Collection, the majority of the specimens in which were personally obtained in May—June 1898, and again in June—July 1901. Other records are by Messrs. F. W. Urich, W. E. Broadway, H. Caracciolo, J. Guppy, and several others. All the Trinidad records at the Natural History Museum, besides those in the Hope Museum at Oxford and those in the Godman and Salvin collection have been laid under contribution, the last generally from the "Biologia Centrali Americana," and not from the actual specimens themselves. There are few new species, which is not surprising seeing that the fauna is essentially Venezuelan and Brazilian, which regions have been so well worked in the last twenty years.

The special insular characteristic is however sufficiently well marked in certain insects to call for notice. *Tithorea megara* (= *T. flavescens*), *Heliconius ethilla* and *Protogonius ochraceus* all exhibit a remarkable pale straw colour of such similarity as to at once suggest a common stress. *Dismorphia broomeæ* joins in, in only a slightly diminished degree, *Mechanitis veritabilis* shows signs of assuming this colouring by the frequent appearance of a yellow streak in the cell of the hind-wing, but the *Ceratinia*, viz. *euclea*, does not show any sign at present of conforming to this colouring. The *Tithorea* in the above trio is by far the most abundant, and is obtainable in the perfect state almost the whole year round. How far this true *T. megara* occurs elsewhere it is impossible to say owing to the confusion in the nomenclature, but *Heliconius ethilla* is almost if not quite confined to Trinidad, and although Herr Stichel has examined my *H. ethilla* and pronounced them to be the same as Weymer's *H. sulphureus* from Thomar on the Rio Negro, I do not agree to this, as Weymer's figure in the "Iris" vi, t. iv, f. 8 (1893) is quite different. The *Protogonius* has only once been taken outside Trinidad, viz. in Cayenne, and this is Butler's type *P. ochraceus*. The *Tithorea*, *Protogonius* and *Heliconius* all conforming in this way is rather remarkable, as 400 miles south in British Guiana in a similar but many times stronger group, a *Tithorea* is only a wanderer, while a *Protogonius* and a corresponding *Dismorphia* are altogether absent. Trinidad is far more sunny, at least in the rainy season, than the forest region of Guiana, and has a considerably drier atmosphere in general.

There are several instances concerning the validity of species that are now proved and which will it is hoped be of interest and usefulness to the systematist and biologist alike. Whether one or two species of *Lycorea* occurred was for a long while a difficult question to answer, but with the present series there is only one answer—there is one, *Lycorea ceres*. *Lycorea atergatis* is in Trinidad only a form of *ceres*, and no line of demarcation is possible nor is it necessary. Northwards however the *ceres* form drops out and southwards the *atergatis* form vanishes. Another problem has been solved by Mr. F. W. Urich. He has bred from the same batch of eggs *Papilio anchisiades* and *Papilio thramenes*, and these two are one species. Further, he has bred me a good series from one batch of eggs of

Papilio zeuxis. The series in the males presents considerable variation, and several males would be called *Papilio alyattes.* Felder's description of ♀ *alyattes* is however not in accordance with any of the ♀ ♀ bred, and Felder's *alyattes* came from Venezuela, but it is a question if Felder's ♀ *alyattes* is not a ♀ of something else, or at any rate not the ♀ of what he named *alyattes* ♂.

There is still a very difficult question that I hope my friend Mr. Urich will try and clear up by breeding, *i. e.* the *Heliconius melpomene* question. Riffarth's monograph on the genus *Heliconius* would make out that there are at least three of these red and black *Heliconius* species—*H. hydara*, *H. euyrades*, and *H. melpomene*, with probably *H. viculata* added. For want of more material I have not been able to see how far this coincides with the evidence of the genitalia.

There are other questions the solution of which are not yet certain. In the Lycænidæ *Tmolus beon*, *Tmolus isobeon*, and *Tmolus bactra* offer considerable material for study. Have we here three or one species? or are these different geographical forms of the same species? and is this a parallel case to *Lycorea ceres* and *Lycorea atergatis?* Such questions as these can only be proved by breeding from the egg. I must confess that I was inclined to disagree with Godman and Salvin in calling them all the same species, namely *beon*, as they do in the "Biologia Centrali Americana," but their long series includes so many forms, that it looks as if there was but one very variable species. *Beon* from British Guiana is very constant and rather different from any form in Trinidad. In the Appendix by Mr. J. Guppy will be found some interesting notes on the life histories of several species, especially so are those on the Erycinids, *Theope eudocia* and *Nymphidium molpe.* It is very possible that many Erycinids have the same habit of living on friendly terms with different species of ants, as, if the reverse were the case, doubtless some species would be in danger of extermination, and be outnumbered by the ants.

To Mr. F. A. Heron, at the South Kensington Museum, I have to tender my very best thanks for help in many ways, besides those resident entomologists abroad who have been already mentioned. To Mr. F. Du Cane Godman I am indebted for access to his superb collection and for personal help in naming the more obscure species.

Family NYMPHALIDÆ.

Subfamily *DANAINÆ.*

1. Danais archippus.

Papilio archippus, Fab., Ent. Syst., iii, 1, p. 49, n. 50 (1793).

The specimens from Trinidad are very richly dark coloured and have the marginal band to the hind-wing very dark and very little spotted.

Range. Throughout the American Continent and West Indies.

2. Danais eresimus.

Papilio eresimus, Cram., Pap. Exot., ii, t. 175, G. H. (1779).

Specimens from Trinidad are uniformly with a dark broad marginal band to hind-wing. Similar specimens occur in other West Indian islands and in Venezuela. Brazilian specimens have the band extremely narrow, frequently almost obsolete.

Range. Venezuela ; Guiana.

Subfamily *LYCOREANÆ.*

The inclusion of the genera *Lycorea* and *Ituna* in the subfamily *Danainæ* does not appear satisfactory on the following grounds. There is no raised patch in the male on vein 2 of the hind-wing ; the cell is much larger and longer; the wings are much more elongated and the antennæ have the last joints yellow.

The subfamily forms a sort of link between *Danainæ* and *Ithomiinæ.*

3. Lycorea ceres. (Pl. XVIII, figs. 4, 4*a*.)

Papilio ceres, Cram., Pap. Exot., i, t. 90, A. (1779).

Range. For the type Guiana ; Amazons.

Var. atergatis, Doubl. and Hew., Gen. D.L., t. 16, f. 1 (1847).

Range. Central America ; Venezuela.

After considerable investigation there can be no doubt that *L. atergatis* is only a form of *ceres* (maintaining *ceres* as the type, because of its having been described so long ago and not because it is scientifically the older species). In Trinidad *ceres* and *atergatis* so run into one another that they must be all of one stock. Going southwards the *ceres*

form becomes fixed, and even in British Guiana the *atergatis* form never occurs. While, on the other hand, going northward into Panama one finds *atergatis* only. In Cuba and Haiti a form of *ceres* has been retained in *L. demeter*, which has the characteristic markings of *ceres* but with the ground-colour much darkened. Kirby, in his catalogue, p. 18, assigns to *demeter* the same place as I have hinted, but puts *atergatis* as a var. of *cleobæa*, Godt. *L. demeter* may or may not be quite removed from *ceres*, but *atergatis* is the same thing in Trinidad, and only further north does it become a definite form. It should be mentioned that Cramer's *ceres* is not the usual *ceres* form in British Guiana, where the outer marginal half of the hind-wing has most often become blackened.

Subfamily *ITHOMIINÆ*.

4. Tithorea megara. (Pl. XVIII, figs. 3—3*b*.)

Heliconius megara, Godt., Enc. Méth., ix, p. 223, n. 59 (1819).

Found abundantly in Trinidad, particularly in the vicinity of Port of Spain. In the Maraval, St. Ann's, and Maracas Valleys I have met with it in numbers.

Range. Brazil (?).

5. Mechanitis veritabilis.

Mechanitis veritabilis, Butl., Cist. Ent., i, p. 155 (1873).

An abundant species throughout the Island.

Range. Colombia.

This is nothing more than a well-defined form of *M. polymnia*. In fact one of my specimens is undoubted *polymnia*, while another has the yellow band beyond the cell much broader than usual, the yellow patch within the cell changed into the ground-colour.

6. Melinæa tachypetis.

Melinæa tachypetis, Feld., Reise Nov. Lep., iii, p. 355, n. 502 (1867).

This must be a very rare species in the Island if it really occurs and some mistake has not been made. Given by W. M. Crowfoot.

Range. Venezuela.

7. Æria agna.

Æria agna, Godm. and Salv., Biol. Centr. Am., Rhop., i, p. 15.

Never, as far as I can ascertain, a common species here. I have some from near Port of Spain.

Range. Central America; Ecuador; Venezuela; Colombia.

8. Ceratinia euclea.

Heliconia euclea, Godt., Enc. Méth., ix, p. 212, n. 49 (1819).

Found commonly in Cascade Valley in May 1898 (*W. J. Kaye*).

Range. Venezuela; Costa Rica; Colombia; Guiana.

9. Ithomia lagusa.

Ithomia lagusa, Hew., Ex. Butt., I, t. 15, f. 89 (1855).

Included by Mr. Crowfoot. I have not been able to trace a Trinidad specimen.

Range. Colombia.

10. Ithomia pellucida.

Ithomia pellucida, Weymer, S.E.Z. 1875, p. 374, t. 2, f. 2.

To be found in many parts of the Island, but not abundantly as a rule. Mr. Caracciolo has secured a long series.

Range. Venezuela; Colombia.

11. Pteronymia nise.

Papilio nise, Cram., Pap. Ex., iii, t. 231 (1782).

A single specimen only. The species is however exceedingly local in my experience in Brit. Guiana, and probably the head-quarters in Trinidad have not been discovered.

Range. Venezuela; Cayenne; Brit. Guiana.

12. Hymenitis ocalea.

Ithomia ocalea, Doubl. and Hew., Gen. D.L., t. 18, f. 4 (1847).

Plentiful in the Cascade Valley.

Range. Venezuela.

13. Hymenitis andromica.

Ithomia andromica, Hew., Ex. Butt., i, 7, f. 38.

Evidently very local or scarce.

Range. Venezuela.

Subfamily *BRASSOLINÆ.*

14. Opsiphanes fabricii.

Opsiphanes fabricii, Boisd., Lép. Guat., p. 54 (1870).

Not rare; in common with all the Brassolinæ found flying more frequently at dusk.

Range. Guiana; Colombia.

14*a*. Opsiphanes cassiæ. (Pl. XVII, figs. 2—2*b*.)

Papilio cassiæ, Linn., Mus. Ulr., p. 265 (1764).

Range. South America.

15. Caligo saltus, sp. n. (Pl. XVII, figs. 1—1*f*.)

Allied to *Caligo ilioneus* but easily separable by the much more steely-blue colour of both fore- and hind-wings. Fore-wing steely-blue beyond the cell and just touching it at the lower angle a broad pale-yellow band runs from the costa to just beyond nervure 1 b. This band is rather paler than the equivalent in *C. ilioneus* and is much less clearly defined in its edges being more obsolescent. Beyond the yellow band the colour is rich brown inclining to black. A white dot is situated between nervures 8, 9 close to the costa. Only rarely are two dots present as in *C. ilioneus*. The submarginal brownish band is very obsolescent in the ♂ and in the ♀ is much less well defined than in *C. ilioneus*. Hind-wing with the basal half of wing steely-blue shot with rich purplish-blue. The marginal half of wing brownish-black. The blue colour of the basal portion of the wing does not extend so far towards anal angle of wing as in its near ally. Under-side very variable and in the same direction as *C. ilioneus*.

Expanse 150—158 mm.

Not rare about cocoa estates but much less common than the following, and is to be found amongst denser undergrowth, as a rule.

16. Caligo eurylochus.

Papilio eurylochus, Cram., Pap. Ex., i, t. 33, A, t. 34, A. (1775).

Var. minor, nov.

Fore-wing steely-blue with a very broad marginal black band

shaded internally with the general ground-colour; from the costa inwards to beyond middle of wing is an indication of a narrow ochreous band just before the broad black marginal band; on the costa it is strongly indicated and quickly merges in tone with the general colour though discernible to almost nervure 2. Between nervures 5, 6 a round black spot is traceable midway between end of cell and outer margin; two other similar black spots are usually present between nervures 6, 7 and 7, 8, the upper always much more distinct and blacker. Hind-wing similar to fore-wing, the marginal band heavier black and the ground-colour more intense and shot deep blue in the outer portion when held at certain angles. The outer margin between nervures 4 and 7, with greyish lunules. Under-side of fore-wing with the greyish shining scales extending to beyond nervure 2. Under-side of hind-wing with the large eye-mark almost circular with the white scales within the pupil forming a curved line and scarcely broken up into white dots except at extremities. The area above the eye-mark dark brown. This Trinidad form of *C. eurylochus* is usually smaller and is usually recognizable by the shot blue colour of the hind-wings not extending down to the anal angle. The apical spots and brownish band down from the tip of the costa is hardly ever present and is never so clear and distinct as in the mainland form of the species.

Common on most of the cocoa estates.

17. Eryphanis polyxena.

Papilio polyxena, Meerb., Afb. Zeldz. Gew., t. 41 (1775).

Not rare near Port of Spain.

Range. Colombia; Brazil.

18. Dynastor darius.

Papilio darius, Fab., Syst. Ent., p. 482, n. 173 (1775).

A specimen in the National Collection.

Range. Tropical South America.

Subfamily *MORPHINÆ*.

19. Morpho peleides.

Morpho peleides, Koll., Denkschr. Akad. Wien., Math., Nat. Cl., 1, p. 356, n. 14 (1850).

Range. Venezuela; Central America.

Common in some of the valleys in the northern range of hills.

Subfamily *ACRÆINÆ.*

20. Actinote anteas.

Acræa anteas, Doubl. and Hew., Gen. D. L., t. 18, f. 5 (1848).

Range. Colombia; Venezuela.

Given by Mr. Crowfoot in his list; I have not seen a Trinidad specimen.

21. Actinote alalia.

Papilio alalia, Feld., Ent. Mon., iv, p. 105, n. 62 (1860).

Range. Brazil.

An uncommon species; flies in the sunshine in a somewhat lazy fashion. Taken at Tabaquite in June 1898 (*W. J. Kaye*).

Subfamily *HELICONINÆ.*

22. Heliconius ethilla.

Heliconia ethilla, Godt., Enc. Méth., ix, p. 219, n. 49 (1819).

Range. Opposite shore of Venezuela.

Fairly common in and around the Botanical Gardens at certain seasons. At the end of June and beginning of July 1901, I captured half-a-dozen specimens, mostly in perfect condition. There is a remarkable specimen in Mr. Godman's collection, which has all the yellow replaced by the ground-colour, and this probably represents the ancestral form, being very close to *metalilis* or *numismaticus* of Venezuela and other parts of the mainland.

23. Heliconius hydara.

Heliconius hydara, Hew., Ex. Butt., iv, Hel. t. 5, f. 14 (1867).

Range. Panama; Colombia; Venezuela.

Identified by Herr Stichel.

24. Heliconius euryades.

Heliconius euryades, Riff., Gatt. Hel., p. 23, Berl. Ent. Z., xlv, p. 205 (1900).

Range. Peru; Venezuela; Colombia (?).

Identified by Herr Stichel.

25. Heliconius melpomene.

Papilio melpomene, Linn., Mus. Ulr., p. 232 (1764).

Range. Guiana; Brazil; Amaz. Inf.; Peru; Ecuador; Colombia; Venezuela.

From Riffarth's "Die Gattung Heliconius" and the description therein I make out that true *melpomene* occurs. It is quite impossible to say which of these black and red melpomene-like species are rare or otherwise. In the aggregate there are hundreds of individuals of this same coloration to be obtained even in the Botanical Gardens, while at about 1000 ft. behind Government House in late June probably thousands could be obtained.

26. Heliconius viculata.

Heliconius viculata, Riff., Gatt. Hel., p. 6, n. 29 (1900).

Range. Venezuela; Surinam; Brazil, Amazons.

I have identified this by Riffarth's description, but in all such cases there must remain some doubt until long series of each of these closely-allied species are available for comparison.

27. Heliconius ricini, Linn., Mus. Ulr., p. 227 (1764).

Range. Tropical South America.

Not at all common (*W. J. Kaye*) (*Caracciolo*).

Verdant Vale, Sangre Grande, and Maraval.

28. Heliconius erato.

Papilio erato, Linn., Mus. Ulr., p. 231 (1764).

Range. Tropical South America.

29. Heliconius antiochus.

Papilio antiochus, Linn., Syst. Nat., l. 2, Add., p. 1068, n. 12 (1767).

Range. Tropical America.

I have never seen a Trinidad specimen; but believe this to be the species that is rumoured to be obtained at the Pitch Lake at La Brea. Mr. Crowfoot includes the species in his list.

30. Eueides isabellæ.

Papilio isabellæ, Cram., Pap. Exot., iv, t. 350, C. D. (1782).

Range. Amazons; Guiana.

Probably locally common. A long series (*Caracciolo*), 1 ♂ (*W. J. Kaye*).

31. Eueides aliphera.

Heliconia aliphera, Godart, Enc. Méth., ix, p. 246, n. 7 (1879).

Range. Venezuela; Brazil.

Locally common. I found it in considerable abundance at about 1000 ft., flying amongst *Colænis julia* on a rough hillside where there was quite a wealth of flowers. At other times the species is to be seen sailing with outstretched wings over the tops of cocoa trees, also frequently in company with the *Colænis*. The colour and markings of these two species are wonderfully alike, and one must suppose that they afford one another protection in sharing like dangers. Godman and Salvin record *E. aliphera* from Central America and draw attention to the similarity of *Colænis delila* (vol. i, p. 163), but do not state if the species are found together. *E. aliphera* from Central America is almost certainly a distinct species with much narrower black borders to both fore- and hind-wing; but it is interesting to note that *C. delila* is much more like these Central American "*aliphera*" than true Brazilian or Trinidadian *aliphera*.

Subfamily *NYMPHALINÆ*.

32. Colænis phærusa.

Papilio phærusa, Linn., Mus. Ulr., p. 293 (1764).

Range. Equatorial and Central America.

Mentioned by Crowfoot. The species must either be very rare or very local in Trinidad.

33. Colænis julia.

Papilio julia, Fab., Syst. Ent., p. 509, n. 281 (1775).

Range. Guiana; Brazil; St. Lucia, W.I.

An abundant species, more particularly at a small altitude of 500 to 1000 ft.

34. Dione juno.

Papilio juno, Cram., Pap. Exot., iii, t. 215, B. C. (1782).

Range. Central America; Brazil; St. Lucia.

Not very common.

35. Dione vanillæ.

Papilio vanillæ, Linn., Mus. Ulr., p. 306 (1764).

Range. West Indies; Guiana; Southern States; Argentine.

An abundant species. The larva chiefly feeds on Guinea grass wherever introduced in preference to the various *passifloræ*, its native pabula.

36. Phyciodes liriope.

Papilio liriope, Cram., Pap. Exot., i, t. l. C. D. (1775).

Range. Tropical America.

Recorded by Crowfoot.

37. Phyciodes claudina.

Acræa claudina, Esch., Kotzeb. Reise, iii, p. 212, t. 8, f. 18, a. b. (1821).

Range. Amazons.

Taken in May 1898 (*W. J. Kaye*); also in Nat. Coll. (*Hart*).

38. Phyciodes leucodesma.

Eresia leucodesma, Feld., Wien. Ent. Mon., v, p. 103, n. 77 (1861).

Range. Venezuela; Colombia.

A very common species in many parts of the Island.

39. Chlosyne saundersii.

Synchloe saundersii, Doubl. and Hew., Gen. D. L., t. 24, f. 2 (1847).

Range. Nicaragua to Paraguay.

Although a widely-spread and apparently generally common species, there is but a single record of a Trinidad specimen, namely, from Sangre Grande. The insect in question has the submarginal row of large orange spots very conspicuous and well defined.

40. Hypanartia lethe.

Papilio lethe, Fab., Ent. Syst., iii, 1, p. 80, n. 250 (1793).

Range. Mexico; Venezuela; Ecuador; Brazil.

Not common. Port of Spain (*W. J. Kaye*).

41. Junonia genoveva.

Papilio genoveva, Cram., Pap. Ex., iv, t. 290, E. F. (1782).

Range. West Indies; Mexico; Honduras; Guiana.

Not very common in my experience, and found in nothing like the abundance in the other islands.

42. Anartia jatrophe.

Papilio jatrophe, Linn., Mus. Ulr., p. 289 (1764).

Range. West Indies; Brazil; Guiana; Venezuela.

An abundant species, particularly frequenting dry weedy situations.

43. Anartia amalthea.

Papilio amalthea, Linn., Mus. Ulr., p. 288 (1764).

Range. Brazil; Venezuela; Guiana; Panama.

An abundant species delighting in damp places. These opposite habits in these two closely-related species are noteworthy.

44. Catonephile numilia.

Papilio numilia ♂, Cram., Pap. Ex., ii, t. 81, E. F. (1779).

Papilio micalia ♀, Cram., Pap. Ex., ii, t. 108, C. D. (1779).

Range. Brazil; Colombia; Guiana.

One ♂, 2 ♀ ♀, taken by Guppy.

Note.—One of these females would be classed as *numilia* (=*micalia*) and the other as *penthia*. It is exceedingly probable that *numilia* has a dimorphic female, as it is not likely that in an island such as Trinidad two female Epicalias taken together would be two different species. The males of *numilia* and *penthia* are identical, and I have therefore not recognised *penthia* as a species.

45. Temenis laothöe.

Papilio laothöe, Cram., Pap. Ex., ii, t. 132, A. B. (1779).

Range. Brazil; Venezuela; Central America.

The form *ariadne*, l. c. t. 180, E. F. (1779), also belonging to the Amazon region.

Never abundant, but pretty generally found in all the valleys in the Northern Range of hills.

46. Dynamine theseus.

Eubagis theseus, Feld., Wien. Ent. Mon., v, p. 106, n. 89 (1861).

Range. Colombia; Venezuela.

A common species in the valleys round Port of Spain. I met with it commonly in Maracas Valley in June and July 1901.

47. Dynamine artemisia.

Papilio artemisia, Fab., Ent. Syst., iii, 1, p. 101, n. 313 (1793).

Range. Central America; Northern Brazil; Venezuela; Colombia.

Uncommon. Taken by *J. H. Hart* at Botanical Gardens and by *Mr. W. E. Broadway* at same place. Maraval (*C. W. Ellacombe*).

48. Dynamine mylitta.

Papilio mylitta, Cram., Pap. Ex., iii, t. 253, D. E. (1782).

Range. Venezuela; Guatemala; Honduras.

Less common than *D. theseus*.

49. Dynamine agacles.

Papilio agacles, Dalm., Anal. Ent., p. 47 (1823).

Range. Cayenne; Northern Brazil.

Recorded by Crowfoot.

[Dynamine egæa.

Papilio egæa, Fab., Syst. Ent., p. 496, n. 231 (1775).

This is a Jamaican species, and has been recorded from Trinidad in error (*W. J. K.*).]

50. Callicore aurelia.

Callicore aurelia, Guén., Mém. Phys. Gén., xxi, p. 385 (1872).

Range?

Local. My brother found the species in abundance flying round a certain tree at Verdant Vale.

In the Maraval Valley I have occasionally seen it. The *C. marchalii* recorded by Crowfoot is no doubt this species, and I have not hesitated to sink it therefore.

51. Catagramma codomannus.

Papilio codomannus, Fab., Spec. Ins., ii, p. 57, n. 253 (1781).

Range. Brazil.

Crowfoot records the species. I saw a couple of specimens in the St. Ann's Valley that I put down to be *Catagramma pitheas*, but they might almost equally well have been this species. Caracciolo has recently taken an undoubted *codomannus*.

52. Hæmatera pyramus.

Papilio pyramus, Fab., Spec. Ins., ii, p. 130, n. 590 (1781).

Range. Brazil; Venezuela.

Whether the insect found in Trinidad is *pyramus* is a little doubtful. The insect is much redder and may be distinct. At all events it is a well-marked form, which I propose to call *var. rubra*.

Var. rubra, nov. (Pl. XVIII, fig. 7.)

Fore-wing very red, the colour reaching right up to the base of wing as in *H. thysbe*, but shot with purplish-blue to a small extent. Hind-wing as in typical *pyramus*, with the red blotch narrow between the costa and vein 8, then suddenly much broader and curved fairly evenly round and not extending further down than vein 5. The shape of the blotch is rather variable, and is sometimes rather produced in the neighbourhood of vein 6. There is a slight purplish gloss as in fore-wing.

Mr. Godman has several similar specimens, one of which is from Trinidad.

At the end of June 1901 I found this insect abundant

in St. Ann's Valley. It frequents damp spots by streams, and when alarmed flies off rapidly and settles then on a branch of a tree near by.

53. Gynæcia dirce.

Papilio dirce, Linn., Mus. Ulr., p. 287 (1764).

Range. Jamaica; Brazil; Guiana.

Not very common.

This species, together with certain (? all) species of *Ageronia*, makes a loud clicking sound when flying. The flight is short and wild and generally a wheeling motion, returning quickly to some bare tree-trunk, where it settles with the wings folded, and head downwards.

54. Ageronia ferentina.

Papilio ferentina, Godt., Enc. Méth., ix, p. 428, n. 248 (1823).

Range. Venezuela; Panama; Mexico; Hayti; Brazil.

Abundant locally.

This species always alights and sits on a bare tree-trunk, with the wings folded flat on to the trunk. Frequently eight or ten will be found thus on a single trunk. If alarmed they will fly off, and return probably to the same tree, but on the opposite side. I have more than once cautiously crept up, and as soon as the butterfly got alarmed it would *walk* round to the opposite side of the tree to which I was standing.

55. Peridromia feronia.

Papilio feronia, Linn., Mus. Ulr., p. 283 (1764).

Range. Brazil; St. Lucia; Ecuador.

Not nearly so common as *A. ferentina*, and partial to a lower elevation.

56. Peridromia amphinome.

Papilio amphinome, Linn., Syst. Nat., i, 2, p. 779, n. 176 (1767).

Range. Brazil.

Rare or very local.

57. Peridromia arethusa.

Papilio arethusa, Cr., Pap. Ex., i, t. 77, E. F. (1779).

Range. Brazil; Venezuela; Mexico; Bolivia.

Recorded by Crowfoot.

58. Didonis biblis.

Papilio biblis, Fabr., Syst. Ent., p. 505, n. 261 (1775).

Range. Colombia; Brazil; Dominica; Guiana.

A common species, particularly abundant in the Maraval Valley. The form in Trinidad is always with a narrow red band to hind-wing.

59. Cystineura cana.

Cystineura cana, Erichs., Schomb. Reisen, iii, p. 599 (1848).

Cystineura coxiana, Butl., P. Z. S., p. 713 (1901).

Range. St. Lucia; Dominica; Guiana.

Very abundant in the neighbourhood of Port of Spain and excessively variable. In Mr. Crowfoot's list *Cystineura hypermnestra*, Hübn., is recorded, but there is scarcely a doubt that *C. cana* was the species which was intended to have been recorded.

60. Pyrrhogyra tipha.

Papilio tipha, Linn., Mus. Ulr., p. 308.

Range. Venezuela; St. Lucia; Brazil.

Not common. At San Fernando in the railway cutting several were taken (June 1898, *W. J. Kaye*), and at Port of Spain I have seen one or two.

61. Megaleura chiron.

Papilio chiron, Fab., Syst. Ent., p. 452, n. 40 (1775).

Range. Tropical South America and Central America.

Frequent near streams. Maracas, common (*W. J. Kaye*).

62. Megaleura peleus.

Papilio peleus, Sulz., Gesch. Ins., t. 13, f. 4 (1776).

Range. Mexico; Brazil; Honduras.

Rare. Has the same habits as *M. chiron*, but is always more difficult to approach.

63. Victorina steneles.

Papilio steneles, Linn., Mus. Ulr., p. 218 (1764).

Range. W. Indies; Central America; Brazil.

In my experience this is a far from common insect in Trinidad, and I have never seen anything approaching the abundance of the species in Jamaica, where it is to be taken in hundreds settling on the rotting mangoes in the Bath district.

64. Hypolimnas misippus.

Papilio misippus, Linn., Mus. Ulr., p. 264 (1764).

Range. India; Africa; Australia; Guiana.

The occurrence of this cosmopolitan species is exceedingly interesting, as I have little doubt that there is no reason to suspect Crowfoot's record. The species can hardly be mistaken. Occurrences must be few and far between, as I have been unable to obtain the species, neither have correspondents succeeded in getting it. I have recently seen a good specimen, caught near the Pitch Lake.

65. Adelpha iphicla.

Papilio iphicla, Linn., Mus. Ulr., p. 311 (1764).
Larva and *Pupa* described by Mrs. E. M. Swainson, Jour. N. Y., 1901, p. 78.

Range. Mexico; Venezuela; Brazil.

Not common.

66. Adelpha cytherea.

Papilio cytherea, Linn., Mus. Ulr., p. 305 (1764).

Range. Brazil, Para, Rio Janeiro; Colombia; St. Lucia.

Very common and generally distributed.

67. Adelpha plesaure.

Adelpha plesaure, Hübn., Zutr. Ex. Schmett., pp. 231, 232 (1823).

Range. Brazil; Colombia.

68. Aganisthos odius.

Papilio odius, Fabr., Syst. Ent., p. 457, n. 60 (1775).

Range. Tropical South America; Central America; Florida; Jamaica; Hayti; the last two producing the form *orion*.

Evidently never abundant. The form is always true *odius* with the narrow pointed yellow area present which is characteristic of the mainland; the forms in Hayti and Jamaica being very distinct with the more truncate yellow marking.

69. Prepona demophon.

Papilio demophon, Clerck, Icones, t. 29, f. 2, t. 42, f. 3 (1764).

Range. Amazons.

This is probably the commonest species of the genus in the Island. I only once saw it myself in the Maraval Valley. Its habits are peculiar. It settles amongst low herbage and is not easily induced to rise, but shuffles about so that very soon the specimen becomes a wreck.

70. Prepona antimache.

Morpho antimache, Hübn., Verz. bek. Schmett., p. 49, n. 458 (1816).

Range. Amazons; Bermudas.

Uncommon. Maraval Valley (*W. J. Kaye*). Has a habit of settling amongst low herbage.

71. Prepona demodice.

Nymphalis demodice, Godart, Enc. Méth., ix, p. 408, n. 193 (1823).

Range. Colombia; Brazil.

This magnificent species is included on the strength of Mr. Crowfoot's record. I have just received a good specimen from Sangre Grande, thus confirming the record.

72. Anæa phidile.

Anæa phidile, Hübn., Zutr. Ex. Schmett., ff. 905, 906 (1837).

Range. Brazil.

Not rare in the Maraval Valley.

73. Zaretes isidora.

Papilio isidora, Cram., Pap. Ex., iii, t. 235, A. B. E. F. (1782).

Range. Nicaragua; Colombia; Brazil.

Not a common species.

74. Siderone marthesia.

Papilio marthesia, Cram., Pap. Ex., ii, t. 191, A. B. (1779).

Range. Brazil; Guiana.

Not rare in the Maraval Valley. The females generally with a yellow ground-colour, shading off considerably into reddish, but never approaching the male in brilliance. Although not usually the case, in Trinidad the females are about as common as the males.

75. Protogonius ochraceus. (Pl. XVII, figs. 3, 3*a*.)

Protogonius ochraceus, Butl., P. Z. S., 1873, p. 773.

Range. Cayenne.

Fairly frequent. It delights in a grassy slope, where sometimes two or three may be found gently fluttering together.

The remarkable sulphur colouring of so many of the Trinidad species is here very extraordinary, as it is the only species of the genus that has so much diverged from the typical brownish colour.

The extreme straw-coloured form in Trinidad is rather different from the darker-coloured type specimen from Cayenne. Whether one would be justified in separating this strongly-marked island form is open to doubt. The number of apical spots is greater in the Trinidad form.

Subfamily *SATYRINÆ.*

76. PIERELLA HYALINUS.

Papilio hyalinus, Gmel., Syst. Nat., , 5, p. 2259, n. 879 (1788).
Pieris dracontis, Hüb., Verz. bek. Schmett., p. 53, n. 500 (1816).

Range. GUIANA.

This species, better known as *Pierella dracontis*, is very common in suitable situations. In dark damp places it is always to be found flying low down and frequently beneath the low undergrowth such as ferns, etc. It is always difficult to approach, and has a most unusual flight.

77. EUPTYCHIA HESIONE.

Papilio hesione, Sulz., Gesch. Ins., p. 144, t. 17, f. 3, 4 (1776).
Papilio ocirrhoe, Fab., Gen. Ins., p. 260 (1777).

Range. COLOMBIA; GUIANA.

One of the commonest species. It is abundant in all damp shady places.

78. EUPTYCHIA MYNCEA.

Papilio myncea, Cram., Pap. Ex., iv, t. 293, C. (1782).

Range. HONDURAS to BRAZIL.

Not rare near Port of Spain. The *Euptychia helle* recorded by Crowfoot was most likely this species.

79. EUPTYCHIA PENELOPE.

Papilio penelope, Fab., Syst. Ent., p. 493, n. 217 (1775).

Range. BRAZIL, Para.

Common at Verdant Vale (*S. Kaye*).

80. EUPTYCHIA RENATA.

Papilio renata, Cram., Pap. Ex., iv, t. 326, A. (1782).

Range. TROPICAL AMERICA.

At St. Ann's (*W. J. Kaye*); Verdant Vale (*S. Kaye*).

[Euptychia sosybius.

Papilio sosybius, Fab., Ent. Syst., iii, 1, p. 219, n. 684 (1793).

This is probably an incorrect identification of Mr. Crowfoot's. The species is a Southern United States and Central American species.]

81. Euptychia hermes.

Papilio hermes, Fab., Syst. Ent., p. 487, n. 195 (1775).

Range. Tropical America.

An abundant species in almost every kind of situation.

82. Euptychia erichto.

Euptychia erichto, Butl., P. Z. S., 1866, p. 501, n. 124, t. 40, f. 12.

Range. British Guiana.

A very uncommon species.

83. Euptychia celmis.

Satyrus celmis, Godt., Enc. Méth., ix, p. 489, n. 38 (1823).

Range. Brazil, Bahia.

Not rare. Botanical Gardens (*J. H. Hart*).

84. Euptychia cephus.

Papilio cephus, Fabr., Syst. Ent., p. 528, n. 359 (1775).
Papilio doris, Cr., Pap. Ex., i, t. 8, B. C. (1775).

Range. Amazons.

Evidently an uncommon species in the Island.
1 ♂, Maraval Valley (*C. W. Ellacombe*).
1 ♂, St. Ann's Valley (*Native collector*).

85. Euptychia junia.

Papilio junia, Cram., Pap. Exot., iv, t. 292, D. E. (1782).

Range. Brazil.

St. Ann's Valley (*Native collector*); Cascade Valley, May 19th, 1898 (*W. J. Kaye*).

86. Euptychia libye.

Papilio libye, Linn., Syst. Nat., i. 2, p. 772, n. 146 (1767).

Range. Brazil, Amazons; Colombia.

Recorded by Crowfoot.

87. Euptychia arnæa.

Papilio arnæa, Fab., Gen. Ins., p. 260 (1777).

Range. Brazil, Amazons; British Guiana.

Very local in Trinidad. The only locality I know of is Verdant Vale, where my brother first found it in plenty in November 1895, and where I again took it, singly, in June 1898.

88. Euptychia brixiola.

Euptychia brixiola, Butl., Proc. Zool. Soc., 1866, n. 74, t. 40, f. 9.

Range. Brazil, Amazon region.

I took a ♂ and ♀ on June 29th, 1898, in the forest near the Palmiste River, Tabaquite. There can be no doubt as to the identity of this species after having carefully compared the two specimens with the fine series of *E. brixiola* in Mr. Godman's collection.

89. Taygetis virgilia.

Papilio virgilia, Cram., Pap. Ex., i, t. 96, C. (1779).

Range. Tropical South America.

It is difficult to say how far this is a common species owing to its similarity on the wing to other species of the genus.

90. Taygetis echo.

Papilio echo, Cram., Pap. Ex., i, t. 57, C. D. (1779).

Range. Brazil.

Tolerably common in shady valleys.

91. Taygetis cleopatra.

Taygetis cleopatra, Feld., Wien. Ent. Mon., vi, p. 176, n. 151 (1862).

Range. Brazil.

In similar situations to the preceding and about in the same numbers.

The *xenana*, Butl., I believe to be only the ♀ or a ♀ form of this species. The only difference is in the colour of the under-side, the markings are identical.

92. Taygetis andromeda.

Papilio andromeda, Cram., Pap. Ex., i, t. 96, A (1779).

Range. Tropical South America.

Rather commoner than either of the two previous species.

93. Taygetis penelea.

Papilio penelea, Cram., Pap. Ex., ii, t. 101, G. (1779).

Range. Tropical South America.

Very common in dark damp places.

Family ERYCINIDÆ.

Subfamily *EUSELASIINÆ.*

94. Helicopis elegans, n. sp. (Pl. XVIII, fig. 6.)

Fore-wing very pale cream-coloured inclining to whitish; the basal area slightly brownish. A black marginal band, broad at apex, running to vein 4, thence to inner margin, of equal width and not extending inwards. Hind-wing brownish at base of the same colour as fore-wing; a rather narrower marginal band than is found in all other species in the genus and made up of three black lines interrupted in the middle by a large yellowish ochreous blotch in which are three or four black spots. There are no metallic markings on the upper-side. Under-side of fore-wing white slightly lemon-coloured at base, a black marginal band divides up at vein 4 into two black parallel lines. Under-side of hind-wing whitish with three post-median black lines, the inner one of which is partly duplicated. Between veins 2, 3; 3, 4; 4, 5; 5, 6 are metallic silvery spots; surrounding these and extending to almost the margin is a deep ochreous patch containing four more similar spots, and above these between veins 4 and 6 is a blackish mark.

Exp. 42 mm.

The species is nearest to *H. selene*, Feld.

One specimen in Nat. Coll. taken by Caracciolo.

95. Perophthalma tenera.

Mesosemia tenera, Westw., Gen. D. L., p. 455, n. 21 (1851).

Range. Brazil; Guiana; Honduras; Venezuela.

Common all round Port of Spain and at Verdant Vale (*W. J. Kaye*).

Subfamily *LEMONIINÆ.*

96. Eurybia halimede.

Limnas subtilis, Hüb., Samm. Ex. Schmett. (1806–1816).

Range. Nicaragua; Colombia; Brazil.

One specimen in Nat. Coll. taken by W. E. Broadway.

97. Mesosemia cippus.

Mesosemia cippus, Hew., Ex. Butt., ii, t. 6, f. 48 (1859).

Range. Brazil.

98. Mesosemia antærice.

Mesosemia antærice, Hew., Ex. Butt., ii, t. 6, f. 52, 53 (1859).

Range. Brazil.

One specimen only.

99. Mesosemia methion.

Mesosemia methion, Hew., Ex. Butt., ii, t. 8, f. 76 (1860).

Range. Brazil.

One specimen, June 1898 (*W. J. Kaye*).

100. Cremna eucharila.

Cremna eucharila, Bates, Trans. Ent. Soc., Ser. iii. (1867), p. 543.

Range. Amazons.

Apparently uncommon.

101. Cremna actoris.

Papilio actoris, Cram., Pap. Exot., i, t. 93, D (1779).

Range. Surinam.

Not common.

102. Zeonia chorinæus.

Papilio chorinæus, Cram., Pap. Exot., i, t. 59, A. (1779).

Range. British Guiana.

St. Ann's Valley in June 1898 and in July 1902 (*W. J. Kaye*). The specimens (several) were taken off the same bush, evidently a sign of extreme localness. The species rests on the outside leaves of the bushes in the hot sunshine.

103. Diorrhina periander.

Papilio periander, Cram., Pap. Exot., ii, t. 188, C. (1779).

Range. Brazil; Venezuela; Guiana.

Found in several of the valleys in June 1898, and at Maracas in July 1901. The ♀ is apparently much scarcer than the ♂ (*W. J. Kaye*).

104. Lymnas iarbus.

Papilio iarbus, Fab., Mant. Ins., ii, p. 83, n. 749 (1787).

Range. Central America; Venezuela.

Very common near Port of Spain. Frequently it is to be observed fluttering against the roof of one's verandah.

105. Lymnas xarifa.

Lymnas xarifa, Hew., Ex. Butt., i, Lymn., t. 1, f. 1 (1852).

Range. Venezuela.

Evidently rare. Only two specimens from Botanical Gardens (*W. J. Kaye*).

106. Cricosoma lucianus.

Papilio lucianus, Fab., Ent. Syst., iii, 1, p. 313, n. 185 (1793).

Range. Venezuela.

One from Tunapuna.

107. Cricosoma pseudocrispus.

Lemonias pseudocrispus, Westw., Gen. D. L., p. 459, n. 27 (1851).

Range. Brazil; Panama; Colombia.

Taken in Morrison Valley, July 1st, 1901, 2 ♂♂ (*W. J. Kaye*). Botanical Gardens (*J. H. Hart*).

108. Cricosoma coccineata, n. sp. (Pl. XVIII, fig. 10.)

Fore-wing vermilion red with the inner half of the wing spotted with black; the discoidal spot is largest of all. In the centre of cell is a pair of spots and at the base a single spot; a marginal series of spots becoming more distinct towards costa and a subterminal line of black dots. Margins of wing and fringes black. Hind-wing as fore-wing; the post-median row of black spots strongly angled between veins 3 and 4. Abdomen red.

Exp. 28 mm.

Taken in the forest near Tabaquite in June 1898 (*W. J. Kaye*).

109. Mesene phareus.

Papilio phareus, Cram., Pap. Exot., ii, t. 170, C. (1779).

Range. Venezuela; Brazil.

Evidently very local. Frequently found on deserted sugar estates.

110. Mesene sagaris.

Papilio sagaris, Cram., Pap. Exot., i, t. 83 D. (1779).

Range. Brazil.

One specimen only from Verdant Vale, November 1895 (*S. Kaye*).

111. Charis avius.

Papilio avius, Cram., Pap. Exot., i, t. 92 B. (1779).

Range. Tropical America.

112. Charis argyrodines.

Charis argyrodines, Bates, E. M. M., iii, p. 154, n. 112 (1866).

Range. Central America; Venezuela; Brazil.

Probably other closely allied species may occur but are overlooked.

113. Anteros formosus.

Papilio formosus, Cram., Pap. Exot., ii, t. 118, G. (1779).

Range. Brazil; Colombia.

Evidently scarce or very local.

114. Sarota gyas.

Papilio gyas, Cram., Pap. Exot., i, t. 28, F. G. (1775).

Range. Brazil; Colombia.

Once in St. Ann's Valley in June 1898 (*W. J. Kaye*).

115. Emesis lucinda.

Papilio lucinda, Cram., Pap. Exot., i, t. 1, E. F. (1775).

Range. Tropical America.

Only single specimens.

116. Emesis fastidiosa.

Emesis fastidiosa, Mén., Cat. Mus. Pet. Lep., i, p. 90, t. 3, f. 5 (1855).

Range. Brazil.

Only single specimens.

117. Emesis fatima.

Papilio fatima, Cram., Pap. Exot., iii, t. 271, A. B. (1782).

Range. Tropical South America.

118. Emesis aurimnia.

Emesis aurimnia, Bdv., Lép. Guat., p. 24 (1870).

Range. Guatemala; Panama; Venezuela; Paraguay.

A single specimen considerably worn, but sufficiently recognisable as to assign it to this species. Taken at about 500 feet behind Government House end of June 1901 (*W. J. Kaye*).

119. Emesis furor.

Emesis furor, Butl., Cist. Ent., i, p. 104 (1872).

Range. Brazil; Costa Rica.

120. Emesis guppyi, n. sp. (Pl. XVIII, fig. 9.)

Fore-wing dull dark brown with several indications of indistinct darker brown lines. Within the discoidal cell these are most apparent and four short marks are discernible besides the linear mark at the end of the cell. A broad paler brown band beyond the middle from costa to tornus bordered on either side with deep brown. Marginal portion of wing uniformly dark brown. Hind-wing of the same ground-colour as fore-wing with numerous darker transverse lines ; the three outer ones complete and the inner ones stopping half-way across the wing. Under-side of fore-wing ochreous with the post-medial band yellow shading off exteriorly into the ground-colour, and bordered interiorly with a dark brown line. Under-side of hind-wing ochreous with the same markings as on the upper-side.

Exp. 32 mm.

Taken in June 1898, probably near Port of Spain. There is a specimen of this same species, only somewhat larger and better coloured, in Mr. Godman's collection from Chinchicua, Colombia.

121. Riodina lysippus.

Papilio lysippus, Linn., Mus. Ulr., p. 332 (1764).

Range. Brazil; Venezuela; Colombia.

Recorded by Crowfoot. Probably very local, as I have never seen a Trinidad specimen.

122. Lasaia meris.

Papilio meris, Cram., Pap. Exot., iv, t. 366.

Range. Tropical America.

Of fairly frequent occurrence.

123. Tharops menander.

Papilio menander, Cram., Pap. Exot., iv, t. 334, C. D. (1782).

Range. Brazil, Amazons.

One specimen at Verdant Vale in June 1898 (*W. J. Kaye*).

124. Euchenais aristus.

Papilio aristus, Stoll, Suppl. Cram. Pap. Exot., t. 39, f. 4, 4*c* (1787).

Range. Guiana; Brazil.

Attached to dark places in the forest.

125. Thisbe irenæa.

Papilo irenæa, Cram., Pap. Exot., iv, t. 328, C. D. (1782).

Range. Guiana; Brazil, Amazons.

Not uncommon; flies high up round the tree-tops, and is difficult to approach.

126. Nymphidium calyce.

Nymphidium calyce, Feld., Wien. Ent. Mon., vi, p. 72, n. 41 (1862).

Range. Brazil, Amazons.

Not rare; flies higher up than the smaller more fragile species.

127. Nymphidium lamis.

Papilio lamis, Cram., Pap. Exot., iv, t. 335, F. G. (1782).

Range. Surinam; Brazil.

128. Nymphidium cachrus.

Papilio cachrus, Fabr., Mant. Ins., ii, p. 78, n. 715 (1787).

Range. Guiana.

About the commonest species of the genus.

129. Nymphidium molpe.

Limnas subtilis molpe, Hübn., Samml. Ex. Schmett (1806–1810).

Range. Guiana; Brazil, Amazons.

An abundant species.
Larva on Cassia. See Appendix.

130. Nymphidium azan.

Nymphidium azan, Doubl., Gen. D. L., t. 73, f. 5 (1851).

Range. Brazil.

An uncommon species.

131. NYMPHIDIUM MANTUS.

Papilio mantus, Cram., Pap. Exot., i, t. 47, F. G. (1779).

Range. BRAZIL; VENEZUELA; GUIANA.

Taken in the Botanical Gardens in May 1898 (*W. J. Kaye*).

I have seen several from Sangre Grande.

132. SYNARGIS ABARIS.

Papilio abaris, Cram., Pap. Exot., i, t. 93, C. (1779).

Range. GUIANA; BRAZIL, Amazons.

One specimen only from Verdant Vale, June 1898.

I have revived the genus *Synargis* of Hübner to take this species. The type of *Synargis* was *lytia*, a species like *abaris* with a sexually different facies in the ♀. The remaining species with ♀♀ differing from the ♂♂ all fall into a group by themselves and have a far stronger flight than the typical species of *Nymphidium*, they have broader wings in the ♀ and have a less acute outer margin with the costa. *Abaris* really stands out by itself with *lytia*, *orestes*, *artos*, *apame*, and others forming a group by themselves with much more ample wings, and with the hind margin of the ♀ rounded and not angled as in *abaris*.

133. THEOPE THOOTES.

Theope thootes, Hew., Ex. Butt., ii, t. 1, f. 9, 10 (1860).

Range. BRAZIL, Amazons.

Once in Cascade Valley in May 1898 (*W. J. Kaye*).

134. THEOPE FOLIORUM. (Pl. XVIII, fig. 2.)

Theope foliorum, Bates, Journ. Linn. Soc., Zool., ix, p. 407 (1868).

Range. BRAZIL, Amazons.

I am unable to distinguish *punctipennis* of Bates from *foliorum*.

Not rare. I netted several in June 1901, in St. Ann's Valley, and as the larva lives on cocoa, it is probably common if properly searched for.

The myrmecophilous habits of this and the succeeding species, as recorded by Mr. J. Guppy in the Appendix

are full of interest and give a clue as to the "modus vivendi" of these larvæ amongst the very numerous ants which infest their food plant.

135. Theope eudocia. (Pl. XVIII, figs. 1—1*d*.)

Theope eudocia, Doubl. and Hew., Gen. D. L., t. 70, f. 4 (1851).

Range. Brazil, Amazons.

Mr. Guppy bred a single specimen from larva found on cocoa. It is of the form with the blue patches on the apical area.

Larva on cocoa. See Appendix.

136. Isapis agyrtus.

Papilio agyrtus, Cram., Pap. Ex., ii, t. 123, 13. C. (1779).

Range. Surinam; Brazil, Amazons.

Family *LYCÆNIDÆ*.

137. Chilades hanno.

Papilio hanno, Stoll, Suppl. Cram. Pap. Exot., t. 39, f. 2 (1790).

Range. Florida to S. Brazil and West Indies.

Very common in dry grassy places.

Syntarucoides, n. gen.

Head medium sized; antennæ less than half the length of costa; palpi slender, the second joint slightly hairy on the under-side; the third joint of nearly equal thickness only slightly more slender, slightly down-curved. Fore-wing a little elongated, the apex not pointed; outer margin evenly curved, inner margin straight; nervures 10, 11 fused on costa closely approximated for part of their length and becoming separate at their origins. Hind-wing rather ample in ♂, more narrow in ♀, with the costa curved at base and almost straight for remaining length, apex greatly curved and outer margin gently curved. No tails to outer margin.

Type *Papilio cassius*, Cr.

138. Syntarucoides cassius.

Papilio cassius, Cram., Pap. Ex., i, t. 23, C. D. (1775).

Range. Jamaica; Mexico; St. Lucia.

Less common than preceding, but found in the same situations.

139. Callipsyche thius.

Hyrcus thius, Hüb., Zutr. Ex. Schmett, ff. 743, 744 (1832).

Range. Brazil.

Recorded by Crowfoot.

Polyniphes, n. gen.

Fore-wing with the costa very strongly arched, apex rounded, and outer margin much curved. The discoidal cell very large and bowed out above and below. Discocellulars strongly angled. In the ♂ the whole of the cell with the exception of the basal portion is occupied with a band of brownish-black scales. Antennæ very slightly chequered on the under-side only and fairly stout for a Lycænid. Palpi upturned ; the third joint very pointed and ending in a fine bristle. Fore-tibia strongly spined.

Type *Thecla dumenilii*, Godt.

140. Polyniphes dumenilii.

Thecla dumenilii, Godart, Enc. Méth., ix, p. 677, n. 187 (1823).
Thecla argiva, Hew.

Range. Venezuela.

I have twice taken this species near Port of Spain. It can easily be mistaken on the wing for *Tmolus albata*.

141. Tmolus echion.

Papilio echion, Linn., Syst. Nat., i, 2, p. 788, n. 224 (1767).

Range. Venezuela ; Brazil, Bahia, Rio Janeiro.

Recorded by Crowfoot. I have not seen Trinidad specimens. In the Hewitson collection specimens of *crolus*, Cramer, are named *echion ;* Crowfoot may have determined specimens from this collection, and it may be that the true *echion*, Linné, does not occur. On the other hand, there is no reason to suppose the non-occurrence of any Venezuelan species.

142. Tmolus beon.

Papilio beon, Cram., Pap. Ex., iv, t. 319, B. C. (1782).

Range. Eastern Brazil; Venezuela.

It is very difficult to say whether we have one or more species to deal with. *Tmolus bactra*, Hew., looks distinct from *beon*, but it may only be a form of it. The amount of blue on the hind-wing cannot be considered as ever constant. We know that in certain Palæarctic *Lycænidæ* the first brood has often much bluer ♀ ♀ than the second brood, and some localities never yield a blue-tinged ♀ at all. The red inner edge of the transverse line on the under-side of the fore-wing of *beon* fades considerably with age, and some specimens (if they are undoubtedly *beon*) have hardly a trace of the red colouring. My own series is composed of four large males taken by my brother at Verdant Vale in the autumn of 1895, and which scarcely have any blue on the fore-wing except on the inner margin; five ♂ ♂ and two ♀ ♀ are *beon* as figured by Cramer; one ♂ is the *bactra* of Hew.; and one ♂ is very like typical *beon*, but with much less blue on the hind-wing, while one is exactly like *beon* on the upper-side but has no trace on the under-side of the red edging to the transverse line. The species is exceedingly abundant nearly everywhere. It should perhaps be added that some specimens have a different lustre to the blue colouring on the hind-wing. The specimens alluded to from Verdant Vale are very pale blue and not nearly so lustrous as the others.

143. Tmolus unilinea, n. sp.

Upper-side of both fore- and hind-wing extremely like *crolus*, Cr., the brand on the discocellulars of fore-wing is however larger and browner in colour. Under-side white; fore-wing with a line composed of brownish-yellow spots commencing immediately below costa and finishing at nervure 2, the upper spots very small, the lower ones gradually becoming larger; outer margin just slightly shaded with greyish. Hind-wing with a large orange blotch just above the cell between nervures 7, 8, an elongated blotch between nervures 4 and 6, a small elongated spot immediately below the cell and a further small spot immediately above nervure 1*b*. Near the outer margin between nervures 2, 3, is a yellow spot with a black centre. At anal angle there is some faint yellowish colour.

Exp. 30 mm.

Described from a specimen in the British Museum sent by H. Caracciolo.

144. Tmolus albata.

Thecla albata, Feld., Reise Nov. Lep., ii, p. 261, 1, n. 310, t. 32, f. 17, 18 (1865).

Range. Venezuela.

Fairly frequent near the Botanical Gardens, in St. Ann's Valley.

145. Tmolus stagira.

Thecla stagira, Hew., Ill. D. L., n. 161, t. 39, f. 120, 121, t. 43, f. 167 (1867).

Range. South America.

Recorded by Crowfoot.

146. Tmolus tephraeus.

Bithys tephraeus, Hüb., Zutr. Ex. Schmett, f. 959, 960 (1837).

Range. Venezuela; Honduras; Brazil, Amazons.

Recorded by Crowfoot.

147. Tmolus ergina.

Thecla ergina, Hew., Ill. D. L., p. 105, n. 137, t. 43, f. 170, 171 (1867).

Range. Cayenne; Venezuela.

Recorded by Crowfoot.

148. Tmolus crolus.

Papilio crolus, Cram., Pap. Ex., iv, t. 333, G. H. (1782).

Range. Honduras to Brazil (Amazon region).

Very common. Appears to be attached to orange trees.

149. Tmolus celmus.

Papilio celmus, Cram., Pap. Ex., i, t. 55, G. H. (1779).

Range. Brazil.

A specimen from Trinidad in the National Collection, and another (a ♀) in my own collection.

150. Callicista mulucha.

Thecla mulucha, Hew., Ill. D. L., n. 81, t. 38, f. 117 (1867).

Range. Brazil, Amazons, Pernambuco.

At the end of June 1901, on the hills behind Government House (*W. J. Kaye*).

151. Tmolus palegon.

Papilio palegon, Cram., Pap. Ex., iii, t. 282, C. D. (1782).

Range. Venezuela; Brazil.

A single specimen in May 1898, at Tabaquite (*W. J. Kaye*); also recorded by Crowfoot.

152. Tmolus talayra.

Thecla talayra, Hew., Desc. Lyc., p. 1, n. 3 (1868).

Range. Brazil.

A single ♀ from Sangre Grande. It is likely that this species is not congeneric with Tmolus.

153. Tmolus perdistincta, n. sp. (Pl. XVIII, fig. 8.)

Upper-side of both wings like *Tmolus beon* or of one of the forms of that species. Fore-wing dark brown. A blue streak on the inner margin from base beyond middle, and above the streak to the lower end of cell is a large patch of dull greenish-blue slate colour. Hind-wing with the costal portion broadly brown; the dull blue colour not extending above the cell nor to the outer margin except near tornus. A conspicuous brick-red spot at anal angle. Under-side of fore-wing pale brownish with a transverse line beyond middle not reaching to inner margin, brown edged exteriorly with dirty whitish. Under-side of hind-wing pale brownish with a conspicuous post-medial transverse broken line of white marks edged interiorly with blackish. A large black spot at anal angle and a small one set in bright red between veins 2, 3. An indication of a similar mark between veins 3, 4.

Expanse 27 mm.

Probably taken at Tabaquite in May 1898 (*W. J. Kaye*).

154. Callicopis calus.

Polyommatus calus, Godt., Enc. Méth., ix, p. 640, n. 83 (1823).

Range. Colombia; Venezuela; Brazil.

Two or three specimens from Sangre Grande.

155. Callicopis demonassa.

Thecla demonassa, Hew., Ill. D. L., Lyc., p. 31, n. 65 (1868).

Range. Venezuela.

Several found at end of May 1898 in the Botanical Gardens, fluttering over a small patch of weeds (*W. J. Kaye*).

156. Callicopis hesperitis.

Callicopis hesperitis, Butl. and Druce, Cist. Ent., i, p. 107 (1872).

Range. Costa Rica; Mexico; Colombia; Guiana; Brazil.

Crowfoot gives this species. I have not traced a Trinidad specimen, but the species is probably overlooked.

157. Bithys dindymus.

Papilio dindymus, Cram., Pap. Ex., i, t. 46, F. G. (1776).

Range. Brazil, Amazons.

Found commonly amongst the orange trees in the Botanical Gardens.

Siderus, n. gen.

Fore-wing with the costa very strongly arched at base and very straight thence to apex. Outer margin bluntly angled at middle. Inner margin straight. Discoidal cell very short with an almost circular dull black band in the ♂ lying over the upper end of the cross bar. A portion of the band lies within the cell and is more brown than black. Vein 2 from beyond middle of cell; 3 and 4 from just beyond the end; 5 from middle of discocellulars which are very oblique, the upper one much the longest; vein 6 from before upper angle; 7 from upper angle; 8 from just beyond angle of cell. Palpi with the 3rd joint slender and rather short, porrect; the 2nd joint just visible when viewed from above.

Type *S. parvinotus.*

158. Siderus parvinotus, n. sp.

Fore-wing much like *Bithys dindymus* except for the shape of the band. Dark shining blue with black only on the outer margin and

none on the costa or only at the extreme margin. Hind-wing of the same colour as fore-wing, the blue reaching almost to costa and without any distinct patch of black. Inner margin iron-blue. Under-side of fore-wing dirty white with a broken line of pure white spots beyond middle from costa to vein 2. Under-side of hind-wing dirty white with a post-medial irregular line of white marks. A black spot at anal angle exteriorly edged with orange ; and between veins 2, 3 is a large reddish-orange spot encasing a black point on the lower side.

Exp. 30 mm.

Taken in May 1898 at the Botanical Gardens (*W. J. Kaye*).

IASPIS, n. gen.

Palpi small, the 3rd joint visible from above. Fore-wing with the costa abruptly arched from base for a short distance ; outer margin almost straight. Vein 5 from much nearer 4 than 6 ; vein 3 from close to lower angle of cell. Veins 7, 8 given off from the same place, beyond the cell is an oblong band of smooth black scales in the ♂. Discocellulars greatly curved inwards and following the outline of the band. Hind-wing with the upper discocellular slightly acute ; lower discocellular forming almost a right angle. Vein 5 about equidistant from 4 and 6. Vein 7 given off long before the end of cell. Inner margin of wing rounded. A medium length tail at the extremity of vein 2 and a shorter one at vein 3.

Type *Symmachia temesa*, Hew.

159. IASPIS TEMESA.

Symmachia temesa, Hew., Ill. D. L., p. 1, n. 2 (1868).

Range. BRAZIL, Amazons ; CAYENNE.

One or two only from Sangre Grande in the interior of the Island.

160. OENOMAUS ORTYGNUS.

Papilio ortygnus, Cram., Pap. Ex., iii, t. 243, B. (1782).

Range. HONDURAS ; BRAZIL, Amazon region.

Fairly common round Port of Spain.

161. PSEUDOLYCÆNA MARSYAS.

Papilio marsyas, Linn., Mus. Ulr., p. 315 (1764).

Range. BRAZIL ; VENEZUELA ; ARGENTINA.

Sometimes found commonly, I believe, in January and February. In Tobago it is reported as abundant.

The flight of this species is peculiar. Although the insect is powerful-looking, it is very lazy on the wing, and never flies for any length of time. It settles on anything, not infrequently the ground, from which it is often difficult to dislodge it from amongst long grass.

162. Cycnus phaleros.

Papilio phaleros, Linn., Syst. Nat., i, 2, p. 796, n. 272 (1767).

Range. Nicaragua; Venezuela; Brazil.

Two specimens in B. M. (*J. H. Hart, H. Caracciolo*).

Arawacus, n. gen.

Palpi small porrect. The third joint just visible from above. Fore-wing (in male) with a large dull black band of smoothly compressed scales lying beyond the lower corner of cell and except for a few isolated scales not lying at all within the cell. Veins 6, 7 from upper angle of cell and vein 8 from quite near the end of cell. Vein 3 from very near the lower angle of cell. Hind-wing greatly produced at anal angle and the inner margin greatly angled just before reaching the tip. At vein 2 is a slender tail given off laterally. No other tails nor rudimentary tails present. Vein 3 from close to lower angle of cell; 5 equi-distant from 4 and 6. Upper arm of cell slightly depressed beyond middle curving out again where vein 7 arises. Female rather larger than male.

Type *Papilio linus*, Sulz.

163. Arawacus linus. (Pl. XVIII, figs. 5—5*b*.)

Papilio linus, Sulz., Gesch. Ins., t. 19, f. 10, 11 (1776).

Range. Venezuela; Guiana; Amazons.

Quite common. In flight this species much resembles *P. marsyas*, but is more jerky. It nearly always settles on a low bush, but does not in my experience ever settle on the ground.

164. Panthiades pelion.

Papilio pelion, Cram., Pap. Ex., i, t. 6, E. F. (1775).

Range. Brazil, Amazon region.

Not rare near Port of Spain.

165. Atlides polybe.

Papilio polybe, Linn., Syst. Nat., i, 2, p. 787, n. 218 (1767).

Range. Brazil.

A single specimen from St. Ann's Valley. Crowfoot did not record this fine species, and it is probably rare.

166. Mithras hemon.

Papilio hemon, Cram., Pap. Ex., i, t. 2, D. E. (1775).

Range. Guiana; Brazil; Venezuela.

A very common species in gardens, scrub, or even dense forest.

Rekoa, n. gen.

Palpi very small and short. Fore-wing long. Costa very slightly arched except at base. At apex the outer margin forms a right angle with costa but slopes away from vein 5 to tornus. Vein 3 from close to end of cell and vein 7 from close to upper angle of cell. Hind-wing much produced at vein 2 and curved gradually away to base. Vein 8 greatly arched immediately after leaving base and approximating to 7 at outer margin. Discocellular almost straight and only slightly oblique. Vein 7 from near upper angle of cell. Given off from the outer side of the wing extension at vein 2 is a long slender tail. No other tail nor rudimentary tail present.

Type *Papilio meton*, Cram.
This genus is close to *Arawacus*.

167. Rekoa meton.

Papilio meton, Cram., Pap. Ex., iii, t. 201, D. E. (1782).

Range. Mexico; Guiana; Brazil.

An uncommon species. I met with a single specimen at Tabaquite in June 1898, flying at the edge of the forest in an open bushy place.

Macusia, n. gen.

Palpi with the 3rd joint very small and invisible when viewed from above. Fore-wing with a smooth patch of slaty-blue sensory hairs on the basal portion of the costa and beyond is a larger patch of more raised black hairs. Vein 1*b* almost quite straight. The lower arm of the cell quite straight, vein 2 radiating greatly from

3 ; vein 5 nearer 6 than 4. Hind-wing with veins 3, 4 on a short stalk ; vein 5 slightly nearer 4 than 6 ; vein 7 from a long way before end of cell ; vein 8 very greatly arched and receding greatly from 7. Anal angle much rounded.

Type *Thecla satyroides.*

168. Macusia satyroides.

Thecla satyroides, Hew., Desc. Lyc., p. 11, n. 26 (1868).

Range. Brazil.

Frequent in St. Ann's Valley and probably elsewhere.

Paiwarria, n. gen.

Palpi slender, the second joint long with smooth appressed scales ; third joint very pointed and slightly scaled pointing downwards. The median tibiæ with a pair of short spurs. Antennæ rather long and slender, the club long and almost of equal thickness throughout. Fore-wing with the costa very greatly arched, the outer margin very straight ; inner margin also almost straight and forming a right angle with outer margin. Discoidal band almost circular. Hind-wing with the anal angle considerably extended and with slender tails at the extremities of nervures 2, 3 and 4, the first at nervure 2 the longest of the three and the one at nervure 4 very short ; nervure 8 receding greatly immediately beyond base and approaching 7 near margin ; 6 and 7 from a long way before end of cell.

Type *Papilio venulius*, Cr.

169. Paiwarria venulius.

Papilio venulius, Cram., Pap. Ex., iii, t. 243, G. (1782).

Range. Surinam ; Cayenne ; Bolivia.

I found a single poor specimen in the St. Ann's Valley in June 1898 flying with *Macusia satyroides.*

170. Chalybs romulus.

Papilio romulus, Fab., Ent. Syst., iii, 1, p. 316, n. 195 (1793).

Papilio janias, Cram., Pap. Ex., iii, t. 213, D. E. (1782).

Range. Guiana ; Brazil.

A single poor specimen in June 1898 in Cascade Valley (*W. J. Kaye*).

171. Evenus regalis.

Papilio regalis, Cram., Pap. Ex., i, t. 72, E. F. (1779).

Range. Tropical South America.

This splendid insect is apparently not rare, as I have seen several specimens in various small collections. Port of Spain and Sangre Grande.

172. Evenus nobilis.

Thecla nobilis, H.-S., Ex. Schmett., p. 55, f. 56 (1853)?

Range. Tropical South America.

Scarcer than the preceding. I have a specimen from the Maraval Valley.

Family PAPILIONIDÆ.

Subfamily *PIERINÆ*.

173. Dismorphia amphione.

Papilio amphione, Cram., Pap. Ex., iii, t. 232, E. F. (1782).

Range. Guiana; Brazil.

I have included this species on the strength of Crowfoot's record, but must confess to being sceptical, as with the particular group of Dismorphias it is so easy to mistake the species, particularly in the ♀. The Brazilian ♀ *amphione* is very like Trinidad ♀ *broomeæ*. It is clear Crowfoot considered he had two species, as he gives *amphione* and another which he merely gives (?). The species with a query was probably what Butler named *broomeæ* in 1899. If *amphione* really occurs and there is no error in determination it must be exceedingly rare.

174. Dismorphia broomeæ.

Dismorphia broomeæ, Butl., Ann. Mag. N. H., iii, p. 391 (1899).

Range. Venezuela.

The characteristic yellow colouring is present in this species particularly on the under-side, and save for the opposite coast of Venezuela (to which the species has

probably spread) the particular form probably does not occur elsewhere. The mainland form which occurs at Caracas and elsewhere, but which has evidently not received a name, is this same species over again without the special yellow insular coloration, in fact is the general mainland type of which *broomeæ* is the insular form. There is some confusion in the types of these species. Butler's ♀ type of *broomeæ* came from Venezuela; this is not the ♀ of *broomeæ* true as found in Trinidad, but is rather the ♀ of the mainland form. The ♀ of *broomeæ* has therefore never been described, so for future reference I append a description.

The species is evidently very uncertain in its appearance, as I have failed to meet with it myself in its known haunts, neither has any collector been able to secure it for me. There are 2 ♂ types in British Museum; 3 ♀♀ and 1 ♂ in the Hope Department of the Oxford Museum, and a ♀ in my own collection presented by Professor Poulton and which came from the same source as those at Oxford.

DISMORPHIA BROOMEÆ ♀.

Fore-wing with the ground-colour very deep brown; on the costa extending from base to three-fourths the length of cell is an orange streak which is terminated by an oblong brown blotch beyond which again is broad yellow to just beyond the cell. Within the cell a long wedge-shaped mark of the ground-colour commences as a point close to base of wing and widens out gradually to just below the blotch on costa; beyond this wedge mark and the end of cell the colouring is a mixture of orange and yellow. Discoidal mark large and conspicuous of the ground-colour and triangular. Below the discoidal mark the wedge mark is continued downwards to near tornus; inside the wedge-shaped mark is a broad deep orange streak from base to near tornus where it shades off into yellow. A narrow brown band of equal width from base running along the entire inner margin and edged for three-fourths of its length with orange. From costa embracing the discoidal mark runs a broad yellow band terminating short of outer margin and a second subapical yellow band composed of three unequal yellow blotches. Hind-wing with the central area from base to outer margin deep orange bordered with the same dark brown ground-colour as fore-wing. Inner margin and portion of outer margin light brown.

Exp. 76 mm.

175. Eurema nise.

Papilio nise, Cram., Pap. Ex., i, t. 20, K. L. (1775).

Range. Colombia; Venezuela; Guiana; Brazil.

Abundant by the roadsides. The yellow of the fore-wing fades to the normal colour of the hind-wing after a time.

[Eurema marginella.

Terias marginella, Feld., Wien. Ent. Mon., v, p. 97, n. 53 (1861).

This is merely a form (dry season ?) of *albula* with the margins to the hind-wing bordered with black.]

176. Eurema albula.

Papilio albula, Cram., Pap. Ex., i, t. 27, E. (1775).

Range. Guiana; Brazil; Venezuela; Central America.

Frequently found in abundance in damp situations. In the Maracas Valley in late June 1901 I found the species particularly abundant.

177. Eurema agave.

Papilio agave, Cram., Pap. Ex., i, t. 20, H. I. (1775).

Range. Colombia; Bolivia; Brazil, Amazons.

There is but the record of a single specimen, one taken at Verdant Vale (*S. Kaye*) in 1896, probably about December. The species is however likely to be overlooked.

178. Eurema lucina.

Terias lucina, Poey, Mem. Cuba., t. 18, f. 8–10 (1851).

Range. Cuba; Honduras.

179. Eurema elathea.

Papilio elathea, Cram., Pap. Ex., ii, t. 99, C. D. (1779).

Range. Cuba; Jamaica; Panama.

As these two species are described, unquestionably both occur in Trinidad, but are they distinct species? Both

occur together in Cuba also, which suggests that the two may be one. The marginal band to the hind-wing in *elathea* appears to be fairly constant, and the black borders of the ♀ are apparently always more heavy. The dry season form of *elathea* may be the same as the dry season form of *lucina*.

180. Eurema palmyra.

Terias palmyra, Poey, Mem. Cuba, t. 24, f. 4–6 (1851).

Range. Venezuela; Colombia; Cuba.

181. Eurema leuce.

Terias leuce, Boisd., Sp. Gén., i, p. 659, n. 10 (1836).

Range. Brazil; Bolivia; Paraguay; W. Indies.

182. Sphænogona gratiosa.

Terias gratiosa, Doubl. and Hew., Gen. D. L., t. 9, f. 5 (1847).

Range. Venezuela; Colombia; Panama.

Never abundant, but pretty general. The flight of a *Sphænogona* is much more rapid than a *Eurema*, and many specimens escape capture.

183. Glutophrissa drusilla.

Papilio drusilla, Cram., Pap. Ex., ii, t. 207, C. (1779).

Range. Guiana; Brazil, Rio Janeiro.

Evidently local. Half-a-dozen specimens were received in a single consignment, but none had been taken before, nor have any further specimens come to hand.

184. Glutophrissa ilaire.

Pieris ilaire, Godt., Enc. Méth, ix, p. 142, n. 83 (1819).

Range. Central America.

Not common.

185. Daptonoura polyhymnia.

Pieris polyhymnia, Feld., Reise Nov. Lep., ii, p. 170, n. 152 (1865).

Range. Venezuela; Colombia.

Not common.

Butler's species *harti* has no logical standing and must be sunk under *polyhymnia*. His types ♂ and ♀ are described from Trinidad specimens, but it is impossible to differentiate the ♀ from ♀ *polyhymnia*, and the ♂ agrees with Felder's description, but there is no ♂ specimen in the British Museum for comparison. It is highly probable that some of Butler's characters are characters brought about by the age of the specimens with which he was comparing the Trinidad fresh examples.

186. Kricogonia lyside.

Colias lyside, Godt., Enc. Méth., ix, p. 98, n. 30 (1819).

Rhodocera terissa, Luc., Rev. Zool., 1852, p. 429.

Range. Jamaica; Cuba; Hayti; Central America.

The occurrence of this species in Trinidad is remarkable and suggests accidental introduction or migration. The single specimen, a ♀, came to me in a batch of papered insects, and there is no doubt about the insect having occurred.

A note concerning this species may here be not out of place. The ♂ sex was described by Lucas and the ♀ sex was described independently by Godart. My correspondent, Mr. C. B. Taylor, in Kingston, Jamaica, has often bred this species, and has proved frequently that *terissa* is only the ♂ of *lyside*.

Itaballia, n. gen.

Fore-wing very strongly arched from base to costa; the tip almost rounded. Outer margin evenly curved to tornus which is blunt. Inner margin slightly upcurved near middle. Discoidal cell scarcely longer than half the length of wing. Hind-wing with costa well curved, the apex quite rounded; outer margin boldly curved. Discoidal cell not more than half the length of wing, the discocellular very slightly oblique with nervure 4. Head large. Palpi very slender porrect, the 2nd joint only slightly clothed with hair. Legs very slender. Antennæ with a long gradually thickened tip.

Type *Picris pandosia*, Hew.

187. Itaballia pandosia.

Pieris pandosia, Hew., Ex. Butt., i, t. 2, f. 14 (1853).

Range. Venezuela.

The record rests on the capture of a single specimen made by myself some time in May or June 1898.

188. Pieris monuste.

Papilio monuste, Linn., Mus. Ulr., p. 237 (1764).

Range. Guiana.

Very common and generally distributed.

189. Callidryas philea.

Papilio philea, Linn., Syst. Nat., i, 2, p. 764, n. 104 (1767).

Range. Brazil; Guiana; Nicaragua; Colombia.

Not abundant. Always found near streams.

190. Callidryas sennöe.

Papilio sennöe, Linn., Syst. Nat., i, 2, p. 764, n. 103 (1767).

Papilio eubule, Linn., Syst. Nat., i, 2, p. 764, n. 102 (1767).

Range. Southern States to Argentina with West Indies.

191. Phœbis argante.

Papilio argante, Fabr., Syst. Ent., p. 470, n. 116 (1775).

Range. Nicaragua; Guiana, Roraima; Brazil, Rio.

Not at all common apparently.

Phœbis hersilia.

Papilio hersilia, Cram., Pap. Ex., ii, t. 173, C. D. (1779).

Phœbis cipris, Cram., Pap. Ex., ii, t. 99, E. F. (1779).

Range. Brazil.

(?) Error of determination. The name appears in Crowfoot's list.

192. Aphrissa statira.

Papilio statira, Cram., Pap. Ex., ii, t. 120, C. D. (1779).

Range. Guiana; Brazil; Peru; Ecuador; Colombia; Panama; St. Lucia.

Locally very common, but not general.

Family PAPILIONIDÆ.

193. Papilio polydamas.

Papilio polydamas, Linn., Mus. Ulr., p. 192 (1764).

Range. Mexico to Argentina.

Not very common. Flies in the sunshine. The true *polydamas* occurs and not the general West Indian form *polycrates*.

194. Papilio zeuxis.

Papilio zeuxis, Luc., Rev. Zool., 1852, p. 190.

Range. Venezuela.

Larva on orange.

The many closely allied species of this group have rendered the identification of this species extremely difficult. Mr. F. W. Urich has bred me a series from a batch of eggs showing considerable variation in the green patch of the fore-wing of the male. Some of these would be called *alyattes*, Feld., which has a greater lustre on the hind-wing and which has a smaller green patch on fore-wing. *Alyattes* ♀♀ are however very different from *zeuxis* ♀♀. There can scarcely be a doubt that, as set forth by Kirby in his Catalogue of Diurnal Lepidoptera (pp. 525, 526), many of these species are only varieties or local forms of *vertumnus*, Cramer, while some of these in themselves vary considerably.

195. Papilio cymocles.

Papilio cymocles, Doubl., Ann. Mag. N. H., xiv, p. 416 (1844).

Range. Unknown. The species was described from Trinidad.

This is probably only a form of *zeuxis*, but *cymocles* having priority *zeuxis* would have to be sunk.

196. Papilio gargasus.

Papilio gargasus, Hübn., Verz. bek. Schmett., p 87, n. 909 (1816).

Range. Brazil, Amazons.

Very abundant in many parts of the Island, particularly frequenting bamboo clumps.

197. Papilio pompeius.

Papilio pompeius, Fab., Mant. Ins., ii, p. 5, n. 37 (1787).

Range. Tropical America.

Var. anchisiades, Esp.

Mr. F. W. Urich has bred from the same batch of eggs *anchisiades*, Esp., and *theramenes*, Feld. I have retained Fabricius' name *pompeius* for this species, as the different forms are not even constant to locality.

The species is fairly abundant in similar situations as the last.

198. Papilio androgeos.

Papilio androgeos, Cr., Pap. Ex., i, t. 16, C. D. (1775) ♀.
Papilio polycaon, Cr., Pap. Ex., iii, t. 203, A. B. (1782) ♂.

Range. Brazil; West Indies.

Not common. The ♀ (*androgeos*) is almost in the same proportions as the ♂ and not specially rare, as is found to be so often the case elsewhere.

199. Papilio thoas.

Papilio thoas, Linn., Mant. Plant., p. 536 (1771).

Range. Southern States; Mexico to South Brazil.

Apparently not common.

Family HESPERIIDÆ.

Subfamily *PYRRHOPYGINÆ.*

200. Pyrrhopyge charybdis, Doubl. and Hew., Gen. D. L., t. 78, f. 2 (1852).

Range. Colombia; Venezuela; Brazil.

The commonest species of the genus. Of frequent occurrence round Port of Spain.

201. Pyrrhopyge phidias.

Papilio phidias, Linn., Mus. Ulr., p. 334 (1764).

Range. Brazil; Bolivia; Colombia.

The species is given in Crowfoot's list. I have not been able to trace a specimen.

Subfamily *HESPERIINÆ*.

202. Acolastus amyntas.

Papilio amyntas, Fab., Syst. Ent., p. 533, n. 304 (1775).

Range. West Indies; Venezuela; Brazil.

Apparently not so common in Trinidad as in some of the other West Indian Islands.

203. Eudamus proteus.

Papilio proteus, Linn., Mus. Ulr., p. 333 (1764).

Range. Tropical America.

An abundant species.

204. Eudamus dorantes.

Papilio dorantes, Stoll, Suppl. Cram. Pap. Ex., t. 39, f. 9 (1790).

Range. Brazil; Venezuela; Honduras; W. Indies.

205. Eudamus catillus.

Papilio catillus, Cram., Pap. Ex., iii, t. 260, F. G. (1782).

Range. Venezuela; Colombia; Brazil.

Very common.

206. Eudamus simplicius.

Papilio simplicius, Stoll, Suppl. Cram. Pap. Ex., t. 39, f. 6, O. E. (1790).

Range. Central America; Brazil; Venezuela.

Very common.

207. Eudamus eurycles.

Hesperia eurycles, Latr., Enc. Méth., ix, p. 730, n. 5 (1823).

Range. Venezuela; Brazil; Mexico; Honduras.

208. Eudamus protillus.

Eudamus protillus, Herr.-Sch., Prod. Syst. Lep., p. 63, n. 19 (1869).

Range. Brazil.

Recorded by Crowfoot.

209. Eudamus brachius.

Goniurus brachius, Hübn., Zutr. Ex. Schmett., f. 609, 610 (1832).

Eudamus doryssus, Swains., Zool. Ill., Ins. ii, t. 48, f. 2 (1833).

Range. Brazil; Nicaragua; Ecuador.

Not common. Occurs generally singly.

210. Eudamus amisus.

Eudamus amisus, Hew., Desc. Hesp., p. 5, n. 5 (1867).

Range. Haiti.

Recorded by Crowfoot. Correct determination (?).

211. Eudamus undulatus.

Eudamus undulatus, Hew., Desc. Hesp., p. 4, n. 4 (1867).

Range. Tropical South America.

Recorded by Crowfoot.

212. Goniurus cœlus.

Papilio cœlus, Cram., Pap. Ex., iv, t. 343, C. D. (1782).

Range. Brazil; Venezuela.

Two specimens in the National Collection taken by W. E. Broadway. A single specimen from St. Ann's Valley (*W. J. Kaye*).

213. Dysenius spurius.

Dysenius spurius, Mabille, Bull. Soc. Ent. Fr. (5), x, p. 46 (1880).

Range. Brazil.

Two specimens in the National Collection (*W. E. Broadway*), one from St. Ann's Valley (*W. J. Kaye*).

214. Spathilepia clonius.

Papilio clonius, Cram., Pap. Ex., i, t. 80, C. D. (1779).

Range. Venezuela; Nicaragua; Brazil.

Common. Difficult to procure in good condition.

215. Epargyreus exadeus.

Papilio exadeus, Cram., Pap. Ex., iii, t. 260, C. (1782).

Range. Brazil; Guatemala; Venezuela; Colombia.

A common species.

216. Proteides evadnes.

Papilio evadnes, Cram., Pap. Ex., iv, t. 343, G. H. (1782).

Range. Tropical America.

Recorded by Crowfoot.

217. Proteides ægita.

Hesperia ægita, Hew., Trans. Ent. Soc., Ser. iii, vol. ii, p. 486, n. i (1866).

Range. Brazil, Para.

Recorded by Crowfoot.

218. Telegonus apastus.

Papilio apastus, Cram., Pap. Ex., ii, t. iii, D. E. (1779).

Range. Brazil; Panama; British Guiana.

Recorded by Crowfoot.

219. Telegonus grenadensis.

Telegonus grenadensis, Schaus, Pr. U. S. N. Mus., xxiv, p. 427 (1902).

Range. Grenada.

A single specimen.

220. Telegonus anaphus.

Papilio anaphus, Cram., Pap. Ex., ii, t. 178, F. (1779).

Range. Brazil; Venezuela; Colombia; Mexico.

Recorded by Crowfoot.

221. Telegonus alardus.

Papilio alardus, Stoll, Supp. Cram. Pap. Ex., t. 39, p. 77, F. (1790).

Range. Venezuela; Colombia; Brazil.

Recorded by Crowfoot.

222. THYMELE FULGERATOR.

Papilio fulgerator, Walch, Naturf., vii, p. 115, t. 1, f. 2, *a*, *b* (1775).

Range. BRAZIL; VENEZUELA; HONDURAS.

One specimen in National Collection and another in my own collection. Apparently uncommon.

223. NASCUS PHOCUS.

Papilio phocus, Cram., Pap. Ex., ii, t. 162, F. (1779).

Range. BRAZIL; PARAGUAY; HONDURAS.

I met with a single specimen in the Maraval Valley in July 1898.

224. BUNGALOTIS MIDAS.

Papilio midas, Cram., Pap. Ex., i, t. 63, G. (1779).

Range. VENEZUELA; BRAZIL; HONDURAS.

225. CECROPTERUS ZAREX.

Cecrops zarex, Hübn., Zutr. Ex. Schmett., pp. 183, 184 (1818).

Range. BRAZIL; VENEZUELA.

226. CECROPTERUS NEIS.

Cecrops neis, Hübn., Zutr. Ex. Schmett., pp. 619, 620 (1832).

Range. BRAZIL; VENEZUELA.

227. CECROPTERUS ITYLUS.

Autochthon itylus, Hübn., Zutr. Ex. Schmett., pp. 249, 250 (1823).

Range. GUIANA.

Recorded by Crowfoot.

228. CECROPTERUS BIPUNCTATUS.

Papilio bipunctatus, Gmel., Syst. Nat., i. 5, p. 2360, n. 900 (1781—1791).

Range. TROPICAL SOUTH AMERICA.

Recorded by Crowfoot.

229. Cæcina calanus.

Cæcina calanus, Godm. and Salv., Biol. Centr. Am., Rhop., ii, p. 343, t. 81, f. 10.

Range. Mexico to Panama.

A single specimen received from Mr. F. W. Urich.

230. Thorybes bathyllus.

Papilio bathyllus, Smith, Abb. Lep. Ins. Georg., i, t. 22 (1797).

Range. Central and South America.

Recorded by Crowfoot.

231. Phanus vitreus.

Papilio vitreus, Cram., Pap. Ex., iv, t. 365, D. (1782)

Range. Honduras; Brazil; Guiana; Panama.

A fairly common species and variable.

232. Phanus ebusus.

Papilio ebusus, Cram., Pap. Ex., iv, t. 300, C. D. (1782).

Range. Surinam.

Recorded by Crowfoot.

233. Cogia calchas.

Eudamus calchas, H.-S., Prodr. Syst. Lep., iii, p. 68, n. 19 (1869).

Range. Brazil; Honduras.

Recorded by Crowfoot.

234. Xenophanes tryxus.

Papilio tryxus, Cram., Pap. Ex., iv, t. 334, G. H. (1782).

Range. Venezuela; Brazil; Ecuador; Colombia.

A fairly common insect.

235. Pythonides lugubris.

Leucochitonea lugubris, Feld., Verh. Zool. Bot. Ges. Wien., 1869, p. 476, n. 32.

Range. Venezuela; Nicaragua.

A single specimen taken in June 1898 in the Botanical Gardens (*W. J. Kaye*).

236. Pythonides cerialis.

Papilio cerialis, Cram., Pap. Ex., iv, t. 392, N. O. (1782).

Range. Venezuela; Brazil; Nicaragua.

Very common on dry grassy banks.

237. Achlyodes terrens.

Achlyodes terrens, W. Schaus, Pr. U. S. Nat. Mus., xxiv, p. 433 (1902).

Range. Venezuela; Brazil.

Is probably mistaken for the previous species on the wing.

238. Sostrata scintillans.

Leucochitonea scintillans, Mabille, Bull. Soc. Ent. Fr. (5), vi, p. 200, n. 40 (1877).

Range. Nicaragua; Guiana.

From the range of this species it may possibly be indigenous as recorded by Crowfoot, but as the previous species is so alike on the upper-side some confusion may have arisen.

239. Sostrata leucorrhoa.

Sostrata leucorrhoa, Godm. and Salv., Biol. Centr. Am., ii, p. 397.

Range. Panama; Colombia; Taboga I.; Venezuela.

Presumably the species from Trinidad is *leucorrhoa*, but the white anal patch on the under-side of the hind-wings is more yellowish than white.

240. Antigonus nearchus.

Hesperia nearchus, Latr., Humb. Bonp. Obs. Zool., ii, p. 135, t. 43, f. 3, 4 (1811—1823).

Range. Honduras; Venezuela; Panama.

Common in St. Ann's Valley (*W. J. Kaye*); Port of Spain (*W. E. Broadway*).

241. Antigonus erosus.

Urbanus vetus erosus, Hübn., Samm. Ex. Schmett. (1806—1816).

Range. Brazil; Nicaragua; Venezuela.

Frequently met with at St. Ann's Valley, Maraval and Verdant Vale in June 1901 (*W. J. Kaye*).

242. Eudamidas ozema.

Achlyodes ozema, Butl., Trans. Ent. Soc., 1870, p. 515.

Range. Mexico to Brazil.

A single specimen taken by W. E. Broadway presumably in the neighbourhood of Port of Spain. A second specimen has recently been taken at Tunapuna.

243. Mylon pulcherius.

Leucochitonea pulcherius, Feld., Verh. Zool. Bot. Ges. Wien., 1869, p. 477, n. 35.

Range. Mexico; Guatemala; Panama; Venezuela.

Recorded by Crowfoot.

244. Camptopleura thrasybulus.

Papilio thrasybulus, Fab., Ent. Syst., iii. 1, p. 346, n. 315.

Range. Brazil; Nicaragua; Venezuela; B. Guiana, Roraima.

245. Diphoridas phalænoides.

Urbanus vetus phalænoides, Hübn., Samm. Ex. Schmett. (1806—1816).

Range. Mexico to Brazil.

Not rare in the Botanical Gardens.

246. Gorgythion pyralina.

Helias pyralina, Moesch., Verh. Zool. Bot. Ges. Wien., xxvi, p. 343, t. 4, f. 31 (1876).

Range. Honduras; Venezuela; B. Guiana.

Probably as common as on the mainland if carefully searched for.

247. Hesperia syrichtus.

Papilio syrichtus, Fab., Syst. Ent., p. 534, n. 394 (1775).

Range. West Indies; Central America; Venezuela; Brazil.

The commonest 'skipper.'

248. Hesperia ruralis.

Syrichtus ruralis, Boisd., Ann. Soc. Ent. Fr., 1852, p. 311.

Range. California.

Crowfoot has given this species, but from its range it looks as if some mistake had arisen in the identification.

249. Heliopetes arsalte.

Papilio arsalte, Linn., Mus. Ulr., p. 245 (1764).

Range. Amazons; Venezuela; Honduras.

Frequent, but not abundant.

250. Staphylus ascalaphus.

Helias ascalaphus, Stgr., Verh. Zool. Bot. Ges. Wien., xxv, p. 116, n. 31 (1876).

Range. Venezuela; Nicaragua; Panama.

June 1898 (*W. J. Kaye*).

251. Staphylus sinepunctis, n. sp.

Fore-wing without any apical spots, brown with the markings black-brown. Across the centre of the wing is a broad V-shaped mark the basal half of which is the broadest and the marginal half is duplicated for half its length from costa, the double bands uniting at near vein 3; beyond the V is a sinuated dark line on a paler ground-colour reaching down to about vein 4 and then merging into the outward half of the V-mark. Tornus with a large round patch of a somewhat dull golden colour but very inconspicuous. Hind-wing with a broad dark central fascia much curved and followed by a lighter edging. Under-side of fore-wing almost uncolorous shining very dark brown slightly lighter at tornus. Under-side of hind-wing with a large dull fawn-coloured patch at anal angle extending over about half the wing area.

Exp. 28 mm.

Taken at end of June 1901 at St. Ann's Valley (*W. J. Kaye*).

252. Staphylus aurocapilla.

Staphylus aurocapilla, Staud., Verh. Zool. Bot. Ges. Wien., xxv.

Range. Mexico to Buenos Ayres.

Probably taken in the Botanical Gardens (*Lady Broome*).

253. Anastrus simplicior.

Pellicia simplicior, Mösch., Verh. Zool. Bot. Ges. Wien., xxvi, p. 342, t. 4, f. 27 (1876).

Range. Jamaica; St. Domingo; Surinam.

One specimen in June 1898 (*W. J. Kaye*).

Subfamily *PAMPHILINÆ*.

254. Vehilius stictomenes.

Staphylus stictomenes, Butl., Trans. Ent. Soc., 1877, p. 153.

Range. Venezuela; Brazil, Amazons.

One specimen in June 1898 (*W. J. Kaye*). Doubtless a common species.

255. Vehilius subplanus, n. sp.

Fore-wing very dark brown with a dull yellowish spot between veins 3 and 4 midway between end of cell and outer margin and a similar spot lying rather nearer to the cell between veins 2, 3. Hind-wing as fore-wing but without markings. The costa almost black. On the under-side of fore-wing the two yellow spots show out conspicuously and towards the margin the veins are slightly indicated. Under-side of hind-wing paler than fore-wing with scarcely a trace of pale scaling on the veins.

Exp. 26 mm.

In June 1898 (*W. J. Kaye*).

256. Cobalus virbius.

Papilio virbius, Cram., Pap. Ex., ii, t. 143, G. (1779).

Range. Brazil.

257. Cobalus cannæ.

Cobalus cannæ, Herr.-Sch., Prodr. Syst. Lep., iii, p. 83 (1869).

Range. Mexico to Argentina.

One specimen in July 1898.

The specimen may be a distinct species, as it has three subapical hyaline spots, but as Godman in the "Biologia Cent. Amer." says that *cannæ* is very variable, it is quite likely that this is only a form of that species.

258. Cobalopsis edda.

Cobalopsis edda, Mab., Compt. Rend. Soc. Ent. Belg., xxxv, p. clxx (1891).

Range. Mexico to Guiana.

A single specimen only in June 1898 (*W. J. Kaye*).

259. Phanis justinianus.

Hesperia justinianus, Latr., Enc. Méth., ix, p. 760.
Thracides aletes, Hüb., Zutr. Ex. Schmett., ff. 731, 732 (1832).

Range. Brazil; Honduras; Mexico; Nicaragua.

A single specimen in July 1898 (*W. J. Kaye*).

260. Phanis almoda.

Hesperia almoda, Hew., Trans. Ent. Soc., Ser. iii, vol. ii, p. 499, n. 36 (1866).

Range. Amazons.

A single specimen taken with the previous species (*W. J. Kaye*). These two species may prove to be one variable one. More material is necessary or life histories are wanted to decide.

261. Artines atizies.

Artines atizies, Godm., Biol. Centr. Am., Rhop., ii, p. 608, t. 103, ff. 49, 50.

Range. Panama; Venezuela; Guiana; Brazil.

Two specimens in St. Ann's Valley in July 1898 (*W. J. Kaye*). The species is very conspicuous on the wing and flies in damp, dark places.

262. Moeris striga.

Talides striga, Geyer in Hübn., Zutr. Ex. Schmett., iv, p. 32, ff. 739, 740.

Range. Mexico to Argentina.

Two ♂♂ and 1 ♀ in June 1901 (*W. J. Kaye*). Easily recognized by the well-marked under-side.

263. Metron chrysogastra.

Pamphila chrysogastra, Butl., Trans. Ent. Soc., p. 506 (1870).

Range. Mexico to Brazil; Amazons.

A single specimen near the Botanical Gardens in June 1901 (*W. J. Kaye*).

264. Thargella fuliginosa.

Thargella fuliginosa, Godm., Biol. Centr. Am., Rhop., ii, p. 564, t. 100, figs. 24, 25 ♂.

Range. Nicaragua; Colombia; British Guiana; Amazons.

Two specimens in June 1898 (*W. J. Kaye*).

265. Megistias telata.

Cobalus telata, H.-S., Prodr. Syst. Lep., iii, p. 81 (1869), T. C. 1, ff. 13, 14, 15.

Range. Mexico; Venezuela; Guiana.

Two specimens from the Maraval Valley (*C. W. Ellacombe*).

266. Megistias epiberus.

Pamphila epiberus, Mab., Le Nat., 1889, p. 134, f. 2.

Range. Mexico to Brazil.

Given by Godman and Salvin as a Trinidad species.

267. Vorates decora.

Cobalus decora, H.-S., Prodr. Syst. Lep., iii, p. 81 (1869).

Range. Mexico; Colombia.

A single specimen taken in May 1898 at Tabaquite (*W. J. Kaye*).

268. Methionopsis modestus.

Methionopsis modestus, Godm., Biol. Centr. Am., Rhop., ii, p. 599, t. 103, ff. 14, 15, 16.

Range. Mexico to Brazil; Taboga I.

A common species on the mainland, and probably so in Trinidad.

269. Hylephila phylæus.

Papilio phylæus, Drury, Ill. Ex. Ent., i, t. 13, f. 4, 5 (1773).

Range. Southern United States to Brazil; West Indies.

Abundant.

270. Thymelicus vibex.

Thymelicus vibex, Hüb., Zutr. Ex. Schmett., ff. 685, 686 (1832).

Range. Southern United States to Paraguay; West Indies.

I have taken more specimens of this than the last, and probably both are equally common.

271. Thymelicus athenion.

Talides athenion, Hübn., Samm. Ex. Schmett. (1816–1841).

Range. Mexico to Brazil.

A single specimen in June 1898 (*W. J. Kaye*).

272. Padraona epictetus.

Papilio epictetus, Fab., Ent. Syst., iii, 1, p. 330, n. 252 (1793).

Range. Tropical America.

Recorded by Crowfoot.

273. Calpodes ethlius.

Papilio ethlius, Cram., Pap. Ex., iv, t. 392, A. B. (1782).

Range. Southern United States to Argentina; West Indies.

A common species. Very fond of flying about Canna blooms.

274. Vacerra litana.

Hesperia litana, Hew., Trans. Ent. Soc. (3), ii, p. 494 (1866).

Range. Mexico to Brazil.

A single specimen in July 1901 (*W. J. Kaye*).

275. Niconiades xanthaphes.

Niconiades xanthaphes, Hübn., Samm. Ex. Schmett. (1816—1841).

Range. Mexico to Brazil.

A single specimen in June 1898 (*W. J. Kaye*).

276. Niconiades gesta.

Thanaos gesta, Herr.-Sch., Corresp. Blatt. Regens., xvii, p. 142 (1863).

Range. Cuba.

Recorded by Crowfoot.

277. Niconiades cæso.

Niconiades cæso, Mabille, Compte Rend. Soc. Ent. Belg., xxxv, p. lxxxviii.

Range. Mexico to Brazil.

278. Zenis minos.

Hesperia minos, Latr., Enc. Méth., ix, p. 756, n. 76 (1823).

Range. Mexico to Brazil.

Recorded by Crowfoot.

279. Carystus artona.

Hesperia artona, Hew., Desc. Hesp., p. 27 (1868).

Range. Nicaragua; Guiana; Brazil, Amazons, Rio.

A single specimen from Tunapuna (*Guppy*).

280. Vettius phyllus.

Papilio phyllus, Cram., Pap. Ex., ii, t. 176, B. C. (1779).

Range. Panama to Brazil.

Fairly frequent.

281. Talides sergestus.

Papilio sergestus, Cram., Pap. Ex., i, t. 74, C. (1779).

Range. Mexico to Brazil.

A single specimen from Tunapuna (*Guppy*).

282. Carystoides basochesii.

Hesperia basochesii, Latr., Enc. Méth., ix, p. 747.

Range. Honduras to Brazil.

A single specimen in the St. Ann's Valley in early July 1901 (*W. J. Kaye*).

283. Orses cynisca.

Hesperia cynisca, Swains., Zool. Ill., iii, 1, t. 40 (1820, 1821).

Range. Mexico to Brazil.

A single specimen secured by F. W. Urich.

284. Perichares corydon.

Papilio corydon, Fab., Syst. Ent., p. 533, n. 385 (1775).

Descriptions of Ovum, Larva and Pupa by E. S. Panton, Journ. Inst. Jamaica, ii, pp. 438, 439 (1897).

Range. Tropical America with West Indies.

I have never seen this species in anything approaching the numbers as found in Jamaica. As the larva feeds on sugar-cane, it is probable that in the vicinity of the sugar estates it would be found plentifully.

285. Perichares heroni, n. sp.

Fore-wing rich deep chocolate-brown ; the apex narrowly white. Beyond the end of cell a small yellow dot. Within the cell lying close but quite free from the discocellulars is a yellow spot contracted in the centre and divided by a fine brown line along the fold. Immediately below this mark is a wedge-shaped yellow spot lying between nervures 3, 4 and a still larger wedge-shaped yellow spot lies between nervures 2, 3 with its upper edge touching the discoidal cell. Under-side of fore-wing with the costa and apical half of wing purplish, the remainder black with the yellow stigmata showing through. Hind-wing purplish suffused with brownish. Two small yellow dots between nervures 3, 4 and 4, 5 respectively. Under-side of abdomen yellow.

Exp. 48 mm.

Taken by Lady Broome.

286. Perichares lotus.

Telegonus lotus, Butl., Trans. Ent. Soc., 1870, p. 495.

Range. Mexico to Ecuador and Venezuela.

A ♂ and a ♀. The species is no doubt mistaken for *Perichares corydon* in the male sex. The ♀ is entirely different and is well figured in Biol. Centr. Am.

287. Thracides phidon.

Papilio phidon, Cram., Pap. Ex., iii, t. 245, F. G. (1782).

Range. Panama to Amazon Region.

288. Thracides antoninus.

Hesperia antoninus, Latr., Enc. Méth., ix, p. 746, n. 47 (1823).

Range. Tropical South America.

Recorded by Crowfoot.

289. Thracides longirostris.

Papilio longirostris, Sepp, Surin. Vlind., i, t. 27 (1848).

Range. Mexico to Brazil.

A single specimen from Tunapuna.

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APPENDIX.

Notes on the habits and early stages of some Trinidad Butterflies. By J. Guppy.

Tithorea megara, Godt. (=T. flavescens, Kirby). (Pl. XVIII, figs. 3—3*b*.)

Ovum. Conical, flattened at top, faintly tinted yellow with numerous cell-like depressions, which are better defined at the upper end, to about a third of the height down.

Larva. Head shining jet black. Abdomen black and white as shown in figure. Frequently the larva is almost black but rarely one is lilac tinted and less opaque looking. Arising from the second segment are two long soft flexible processes which, when the larva is alarmed, are twitched nervously.

Habits. The larva is day feeding and is easily noticed on its food-plant (*Echites sp.*), a low creeper which is very abundant and hardy. The larva, which is sluggish, is to be found all the year round in Tunapuna. The imago lays her eggs singly on the under-side of a leaf generally about mid-day or early afternoon.

Lycorea eeres, Cram. (Pl. XVIII, figs. 4, 4*a*.)

Ovum. Much like that of *Tithorea flavescens* only larger. It is placed on the under-side of a leaf of cocoa or a plant that resembles a rubber plant. The egg hatches in about five days.

Larva. Black and white as shown in figures. Head shining black. From the fourth segment to the anal segment the white hook-like marks become yellow in the mature larva.* As in *T. flavescens* there are two horn-like processes on the second segment. In habits the larva is sluggish and feeds by day.

Heterosais ocalea.

Ovum. Pearly white ribbed longitudinally. Resembles *Tithorea megara*, but is shorter and of larger circumference.

Laid singly on under-side of a leaf usually near a stream and about two feet from the ground. Oval period five days.

* Presumably Mr. Guppy has not given a figure of the larva in its last skin, unless by "mature" he means the final change of colour undergone previous to pupation.—W. J. K.

Larva. Semi-transparent like *Mechanitis veritabilis* when newly hatched, changing later to a shining transparent bottle-green with a greenish-white head. When mature sometimes more or less translucent greenish, paler or clearer but without any definite markings save a dorsal stripe caused by the food showing through the skin.

When at rest the larva invariably assumes a coiled-up attitude with the head bent round to touch the body. Feeding takes place from the under-side of the leaf and the larva is sluggish. The period from hatching to pupating is about nine days.*

Protogonius ochraceus, Butl. (Pl. XVII, figs. 3, 3*a*.)

The egg is laid on the under-side of a leaf singly, and I noticed the female depositing at 9.30 A.M. near a stream. It is smooth, shining, and translucent, and is faintly tinted green. The micropyle is situated in a basin-like depression at the top.

Caligo saltus, Kaye. (Pl. XVII, figs. 1—1*f*.)

The larva of *Caligo ilioneus* (l. c. saltus, n. sp.), feeds on banana. The larva is shown in all its stages except after the 3rd month.†

Opsiphanes cassiæ, Linn. (Pl. XVII, figs. 2—2*b*.)

The larva is shown after 1st and 2nd month and when full grown. The full-fed larva is sometimes rather greener than shown.‡

Theope eudocia, Hew. (Pl. XVIII, figs. 1, 1*a*.)

Larva. Head small, prominent, black and shining with a whitish inverted V-mark. Abdomen light green with a yellowish tinge, 1st segment with two remarkable bunches of club-shaped black and

---

* It is unfortunate that Mr. Guppy is unable to say definitely whether nine days was the actual larval existence of this species. If that were true the complete metamorphoses would only take probably three weeks or less. It is quite possible for an Ithomiine to do this, as Mr. F. W. Urich has frequently told me that *Mechanitis veritabilis* goes through all its stages in a month. The *Ithomiinæ* are doubtless amongst the most rapid breeders of the Lepidoptera, and hence to a great extent their prodigious numbers.—W. J. K.

† Mr. Guppy made a sketch of the larva at this stage and reproduction was not possible.

‡ No food-plant is given. It is probably banana.—W. J. K.

brown protuberances projecting forward with a few small intermediate brown ones. From these rise some fine whitish hairs. A fringe of similar hairs surrounds the body of the larva. A very peculiar and remarkable feature is the anal segment, which has a sort of bony whitish scale flat and shining and divided by a black line; immediately in front of this are two brown wart-like humps lighter in the centre.

Habits. The larva feeds from the inside of a rolled cocoa leaf; the young and tender leaves being chosen. The larva is mymecophilous and lives surrounded by ants within the rolled-up leaf. The ants evidently protect the larva and use it as an ant-cow is used. The wart-like portions on the anal segment are tickled and an exudation ensues which the ants are eager to obtain. When I removed a larva the ants made a great fuss. They smell very strongly of formic acid and are very active and build paper nests among the leaves. They frequently run over the larva, which does not take any apparent notice of the proceeding.

Pupa. Attached by the tail with a girth round the centre as in the Theclid species.

Theope foliorum, Bates. (Pl. XVIII, fig. 2.)

Larva. Very similar to *Theope eudocia* and lives on the same plant under the same conditions.

Nymphidium molpe.

Larva. Head small and hairy. Abdomen flat slug-shaped very similar in shape and habits to the two preceding *Theope* species. A pair of horn-like protuberances take the place of the club-like ones in the foregoing. Before pupating the body turns brownish. The anal segment is similar to the Theope larvæ and there are large ants that attend and milk the larvæ. These ants are solitary, are armed with a powerful pair of jaws, and when I went to remove them from the backs of the larvæ, they snapped violently at the piece of wood I was holding. A pair of larvæ are generally found on each plant and are to be obtained chiefly on the low-growing *Cassia* plants, chiefly through the dry season, though some are to be found at all times.

Pupa. Very much like a piece of wood.

Mechanitis veritabilis, Butl.

Ovum. Pure white with about thirteen longitudinal ridges, spindle-shaped. The micropyle appearing as a small flattened area at the apex. The eggs are laid regularly in batches, but each egg is quite

detached. From twelve to twenty-five are laid at a time on the upper-side of a leaf.

Habits of larva. The larvæ are gregarious and are sluggish. Under domestication they are very easy to rear.

Arawacus linus, Sulz. (Pl. XVIII, figs. 5—5*b*.)

Ovum. Laid singly on stem of plant near the top.

Larva. Head small, retractile. Abdomen green covered with fine downy hair and with a series of large tufts down the back.

Habits. The larva is very sluggish and usually eats holes from the upper-side of a leaf of cocoa. The butterfly nearly always breeds in a shady place near a stream, and can never be induced to fly far, seeming to be much attached to its favourite haunt.

Mithras hemon, Cram.

Larva. Pink or whitish-pink and very much the same colour as the very young shoots of the cocoa on which it feeds. The shoots that spring around the stem or trunk of the cocoa are those usually selected.

Explanation of Plate XVII.

Fig. 1. *Caligo saltus*, ovum.
1*a*. „ „ larva just hatched.
1*b*. „ „ „ after 1st moult.
1c. „ „ „ „ „
1*d*. „ „ „ „ 2nd moult.
1*e*. „ „ „ „ 4th moult.
1*f*. „ „ „ full fed.
2. *Opsiphanes cassiæ*, larva after 1st moult.
2*a*. „ „ „ „ 2nd moult.
2*b*. „ „ „ full fed.
3. *Protogonius ochraceus*, ovum.
3*a*. „ „ „ side view.

Explanation of Plate XVIII.

Fig. 1. *Theope eudocia*, larva full fed.
1*a*. „ „ „ much enlarged.
1*b*. „ „ head of larva.
1*c*. „ „ growth at side of head of larva.
1*d*. „ „ the growth enlarged.
2. *Theope foliorum*, larva full fed.
3. *Tithorea megara*, larva after 1st moult.
3*a*. „ „ larva full fed, lateral view.
3*b*. „ „ „ „ dorsal view.
4. *Lycorea ceres*, larva after 1st moult.
4*a*. „ „ „ full fed.
5. *Aranacus linus*, larva full fed.
5*a*. „ „ pupa.
5*b*. „ „ empty pupa case.
6. *Helicopis elegans*, n. sp.
7. *Hæmatera pyramus*, var. rubra, nov.
8. *Tmolus perdistincta*, n. sp.
9. *Emesis guppyi*, n. sp.
10. *Cricosoma coccinea*, n. sp.

XI. *On some new or imperfectly-known forms of South-African Butterflies.* By Roland Trimen, M.A., F.R.S., etc.

[Read February 3rd, 1904.]

Plates XIX and XX.

For the welcome opportunity of describing and figuring the few forms included in this paper, I am indebted to my friend and correspondent for many years, Mr. H. L. Langley Feltham, F.E.S., of Johannesburg, Transvaal, from whom I received all of them except *Lycæna lerothodi*, a new species from Basutoland in the collection of the British Museum. The most notable of the butterflies here dealt with are a new species of *Zeritis*, discovered by Mr. Feltham in a tract so comparatively well worked as the Cape Peninsula, and the melanic aberration of *Colias electra*, taken in the same district by Mr. A. Duncan.

I desire to express my acknowledgments to the guardians of the National Collection for permission to describe and figure *Lycæna lerothodi* and two of the specimens of *Zeritis thysbe*, var., presented by Mr. Feltham in 1900; and I am glad to add that, in accordance with Mr. Feltham's wishes, specimens of the new *Zeritis* and of several other species will be placed in the British Museum, to which Mr. Duncan will also present the unique melanic *Colias electra*.

Family NYMPHALIDÆ.

Subfamily *ACRÆINÆ*.

Genus Acræa.

Acræa rahira, Boisd. (Plate XIX, figs. 1, 1*a*, 1*b*.)

♂. *Acræa rahira*, Boisd., Faune Ent. de Madag., etc., p. 33, pl. 5, ff. 4, 5 (1833).

♂, ♀. *Acræa rahira*, Trim., Rhop. Afr. Aust., i, p. 103 (1862); and S.-Afr. Butt., i, p. 166, n. 50 (1887).

♂, ♀. *Acræa rahira*, Mabille, in Grandid. Hist. Nat., etc., Madag., Lép., i, p. 110, and ii, pl. 11, ff. 9, 10 [♀] (1885–87).

Aberration (♀).—Trim., Proc. Zool. Soc. Lond., 1891, p. 73, footnote.

I have received from Mr. Feltham two remarkable *Aberrations* of the ♂ of this species, both taken at Johannesburg, Transvaal.

The first, taken by Mr. Feltham on 16th April, 1893, has nearly all the black spots on both upper and under surfaces greatly enlarged and elongated, especially in the hind-wings, where those of the discal series are wedge-shaped, and occupying nearly the whole area of the usual unmarked band of whitish-yellow beyond the series in normal specimens, while the usual black streak externally bounding the band is wanting. This example closely resembles the ♀ captured on the Shashani River, Matabeleland, by Mr. F. C. Selous in the year 1882, which I briefly described (*l. c.*) in 1891, but has the spots of the discal series narrower, more acuminate externally, and more separated, and those of the right fore-wing obsolescent.

The second *Aberration*, captured by Mr. A. Ross on 4th April, 1898, presents exactly the opposite tendency, *vid.*: the failure of the black macular markings. All the spots are wanting on both surfaces, except (in the fore-wing) the terminal disco-cellular spot, a minute spot in about the middle of the discoidal cell, and two dots representing the 2nd and 3rd spots of the normal discal series; and (in the hind-wing) two very small terminal disco-cellular spots, and indistinct traces of two basal spots—more defined on the under-side. It is noticeable in this example on the upper-side that the strong fuscous hind-marginal nervular clouding is not diminished, but on the contrary rather more developed than usual. On the under-side of the hind-wing the reddish inter-nervular clouding is wanting before middle and much reduced beyond middle, and there is no trace of the transverse black streak beyond middle.

For purposes of comparison, and in view of the fact that no good figure of the ♂ *A. rahira* appears to have been published, I give an illustration of the normal aspect of that sex from a specimen taken by myself near Grahamstown, Cape Colony.

Family LYCÆNIDÆ.

Genus ZERITIS.

Zeritis Felthami, n. sp. (Plate XIX, figs. 2, 2*a*.)

Exp. al. (♂) 10½—13½ lin.; (♀) 12½—13½ lin.

Nearly allied to *Z. zeuxo* (Linn.) and *Z. chrysaor* (Trim.). ♂. *Sub-metallic reddish-orange, with a common discal series of black spots; fore-wing with a moderately-broad hind-marginal black border, containing externally a series of more or less developed spots of the ground-colour; hind-wing with an almost hind-marginal series of completely-separated black spots. Fore-wing*: a rather large elongate-subquadrate terminal disco-cellular black spot; in 8 out of 15 specimens, a much smaller black spot, variable in size and shape, just below second subcostal nervule; sometimes (in 5 specimens) a small black spot, variable in size and distinctness, before middle, below and near origin of first median nervule; spots of discal series five, somewhat rounded, of moderate size, the upper three contiguous and forming a short curved irregular sub-apical narrow bar, and the fourth and fifth separate, placed obliquely (the fifth beyond the fourth) above and below second median nervule respectively; in five examples also an inferior smaller sixth discal spot, very variable in size and distinctness, situated before the fifth spot and below first median nervule; base very narrowly blackish except for a slight extension on inner-margin; hind-marginal black border wider apically, where it emits inwardly a black costal streak (more or less mixed with the orange ground-colour) touching first spot of discal series and sometimes the small spot preceding it; the border very rarely quite reaching posterior angle, becoming obsolete, or attenuated to a point, above submedian nervure, its inner edge rather irregular and usually emitting inwardly very short linear nervular streaks; the spots of the ground-colour in external series are seven, close to hind-margin, inter-nervular, thin, variable in development (first and second sometimes indistinct), being occasionally so enlarged as to form a sub-macular streak crossed only by black nervular lines,—the last spot incompletely separated from orange ground-colour. *Hind-wing*: base more widely blackish than in fore-wing; blackish suffusion prolonged somewhat widely along inner-margin to considerably beyond middle, where it narrows to a point; a terminal disco-cellular linear or sub-linear black streak, very variable in development—wanting in four examples; seven spots (very variable in size, and the 5th and 7th frequently and the 1st sometimes wanting) in discal series, of which the upper four form a nearly straight row between costa and third

median nervule, and the 5th and 7th are a little nearer base than the 4th and 6th; seven spots in series very close to hind-margin,—of which the 1st and 2nd (and sometimes the 3rd) are much larger than the others (rarely almost touching each other), and the 6th very small or wanting altogether, while the 7th at anal angle is rather large, elongate, and always well-marked; a very fine linear black hind-marginal edging. *Cilia* in both wings uniform dark- or brownish-grey. UNDER-SIDE.—*Hind-wing and apical-hind-marginal border of fore-wing dull isabelline-grey, with a more or less decided ferruginous tinge;—the hind-wing markings inconspicuous, being slightly paler than the ground-colour but with thin dull-grey centres and linear edges of a more decided and darker ferruginous. Fore-wing*: ground-colour not glistening and very much paler than on upper-side, especially along inner-margin; terminal disco-cellular spot and spots of discal series (always six) disposed as on upper-side; spot below 1st median nervule before middle always present and well-marked but variable in shape; the following additional spots, *vid.*:—in discoidal cell a very small one near base, and a larger one midway between it and terminal spot; a minute second spot immediately above terminal spot; and a submarginal series of six small spots (of which the lower three are blackish, but the others very faint and obsolescent); at base a rather large blackish mark between median and submedian nervures; the three cellular and two minute costal spots, and the upper three spots of discal series, all more or less conspicuously centred with metallic steely scales. *Hind-wing*: the following sub-ocellate markings with dull-grey centres and greyish-ferruginous edges, *vid.*:—a sub-basal curved series of four, of which the uppermost is largest and sub-reniform, and the others about equal in size and circular, the second being in discoidal cell; a large reniform one at extremity of cell; a rather regular series of eight good-sized contiguous spots, of which the first is broadly lunate and the others elongate-ovate, the 5th being the smallest (between 2nd and 1st median nervules) and lying about half out of line before the rest; and a hind-marginal series of eight imperfect more coalescent similar markings, with deeper ferruginous edges.

(Described from 15 examples.)

♀. Slightly paler than ♂; black spots larger and more constant both in number and size—especially those of the discal and hind-marginal series in hind-wing; basal blackish not so dark but much more extended—especially in hind-wing where it is rather wide on costa, fills discoidal cell, and coalesces with inner-marginal blackish below cell. *Fore-wing*: hind-marginal black border wider, with its

external series of orange elongate marks forming an almost continuous streak broken only by the crossing dark nervules. UNDER-SIDE. —As in ♂.

(Described from 4 examples.)

From *Z. zeuxo* (Linn.), this interesting species is distinguished by its rather redder and less metallic upper-side, with the hind-marginal border considerably narrower and in the fore-wing bearing an external series of marks of the ground-colour; and also by its much paler and ferruginous-tinged under-side, with the markings of the hind-wing larger and sub-ocellate (especially the discal series, which is composed of contiguous spots); the outline of the wings, moreover, presents a more decided sub-apical prominence in the fore-wing and a much more acute anal-angular projection in the hind-wing. In these particulars of outline *Z. Feltham*i agrees very closely with *Z. chrysaor*, Trim., but differs in its very much less metallic upper-side, with the hind-marginal border considerably broader in the fore-wing and externally marked with orange; and also in the under-side, where (although the ferruginous-tinged isabelline colour is the same) the large sub-ocellate more or less contiguous markings are altogether unlike the minute widely separated and more irregularly disposed spots borne by *Chrysaor*. It is worthy of note that the variable hind-marginal series of orange marks along the outer edge of the black border of the fore-wing is a near approximation to the corresponding lunulate orange edging so characteristic of *Z. thysbe* (L.), *Z. Osbecki*, Auriv., and *Z. palmus*, Cram., in the next group of the genus.

Mr. Feltham, after whom I have the pleasure of naming this butterfly, has sent me full notes of his experiences respecting it, and I give here a summary of them. The first example was taken on 13th April, 1900, on the sand dunes just beyond the mouth of the Muizenberg Vlei in the Cape Peninsula, and on the 27th October following four others were captured among the sand-hills near Retreat Station on the railway between Wynberg and Muizenberg. Subsequent captures in the same locality were as follows, *vid.*:—in 1900, five on the 10th November, three on the 22nd November, two on 15th December; in 1901, two on 8th February; and in 1902, one on 1st December. Visits to Retreat on 21st December, 1900, and on 2nd and 12th

January, and 2nd March, 1901, yielded no examples. The habits of the butterfly were more like those of *Z. thysbe* than those of *Z. zeuxo* (which keeps almost exclusively about a shrubby *Senecio*); its flight being extremely rapid and difficult to follow, while it settled on various bushes but never on the ground.

Mr. Feltham on first meeting with this *Zeritis* was inclined to think it might be a seasonal form of *Z. zeuxo*, or a "Flats" variety of *Z. chrysaor*, but further acquaintance rightly convinced him of its distinctness, alike in characters and habits, from both those allied species; and he is to be congratulated on detecting a new form presenting affinities of so much interest in so well-known and comparatively well-worked a district as the Cape Peninsula. It is clear that *Z. Felthami* is no casual visitor but a settled resident; and I should feel more surprise than I do at its having escaped my many years' researches in its *habitat*, but for the facts that in the district concerned many insects and plants are confined to extremely limited areas, and that they are often most remarkably intermittent in their appearance or flowering respectively.*

ZERITIS THYSBE (Linn.). (Plate XIX, figs. 3, 3*a*.)

Papilio thysbe, Linn., Mus. Lud. Ul. Reg., p. 330, n. 148 (1764).

Zeritis thysbe, "Variety or Sport," ♂, Trim., Rhop. Afr. Aust., ii, p. 344 (1866); Butler, Proc. Zool. Soc., Lond., 1868, p. 223, pl. xvii, f. 5; "Aberration, ♂," Trim., S.-Afr. Butt., ii, p. 182 (1887).

Zeritis thysbe, "Distinct dark variety," ♂ and ♀, Feltham, Proc. Ent. Soc. Lond., 1900, p. xxi.

For many years only three examples, all ♂♂, were known to me of the very beautiful variation of *Z. thysbe* in which

* Mr. Feltham was so fortunate as to make a second addition to the limited number of butterflies inhabiting the Cape Peninsula, taking in 1900, at the same locality, a number of examples of a small Hesperide, *Kedestes niveostriga* (Trim.), previously known in the Cape Colony only from the far-distant north-eastern district about Dordrecht. A specimen received from the captor is dated "Muizenberg Vlei, 1st December, 1902," and it agrees closely with the variety prevalent at Dordrecht and in Basutoland, which is smaller than the Kaffrarian and Natalian type-form and has the sub-vitreous spots of the fore-wing much reduced in size and sometimes obsolete.

the brilliant silvery-blue gloss from the base outward is greatly extended, so as to reduce the orange ground-colour in the hind-wing to a more or less imperfect hind-marginal macular border, and (in conjunction with a very broad blackening of the apical area) wholly obliterating it in the fore-wing. These three examples were taken at long intervals; the first as far back as the year 1815 at Genadendal, Cape Colony, by William Burchell, the second and third not till 1865 and 1868 respectively, but both on Table Mountain. I never met with a similar example during my own long collecting experience in South Africa, although (as noted fully in my "South-African Butterflies," vol. ii) I had found considerable variation in the direction of the examples in question, and had received from Kaffraria specimens in which the silvery-blue suffusion was not very much less extended.* I was thus naturally led to regard the three specimens above mentioned as individual extreme aberrations of a variable species; but Mr. Feltham's discovery during the summer of 1899–1900 of a considerable number of this brilliant variation in a very restricted area on the summit of the Muizenberg mountain in the Cape Peninsula—see his most interesting account in Proc. Ent. Soc. Lond., Nov. 7th, 1900, pp. xix–xxi—has put an entirely different aspect on the case. Mr. Feltham took at various dates from 22nd October to 4th March, 44 ♂♂ and 11 ♀♀; he describes considerable variation among the ♂♂—especially as regards the spots of orange which sometimes occur in the broad black apical and hind-marginal space in the fore-wing, and the extent of the orange hind-marginal border in the hind-wing—and notes that the ♀♀ were "distinguishable from those of typical *Thysbe* by their smaller size, broader black hind-marginal band and larger spots above." I fully agree with his conclusion that the facts he mentions "seem to justify us in regarding this mountain form as a distinct dark variety rather than an accidental sport."

The two ♂♂ and a ♀ exhibited at the Entomological Society at the Meeting mentioned were presented by Mr. Feltham to the British Museum, and I am permitted to give the accompanying figures of the ♀ and of the ♂ which exhibit some remains of the typical orange ground-colour

* Three similar but larger ♂♂ were taken by Mr. C. N. Barker near Port Elizabeth, Cape Colony, in the year 1895, and were presented to me with the rest of his fine collection in 1898.

in the form of two short series of spots crossing the subapical black area.

ZERITIS MOLOMO, Trim. (Plate XIX, figs. 4, 4*a*.)

Zeritis molomo, Trim., Trans. Ent. Soc. Lond., 1870, p. 373, pl. vi, f. 9 (♀); and S.-Afr. Butt., ii, p. 205 (1887).

There are two corrections to be made in my published accounts of this butterfly. In the first place the dubious "♂," noted in the first account and described in the second, proved, on comparison with subsequent accessions, to be actually an unusually small ♀; this error, however, fortunately extended to the description of the upper-side only, there being scarcely any difference in the scars as regards the under-side. In the second place—also on the study of fuller material—I now consider that the "Variety A" described (*op. cit.* p. 206) should not be considered as a form of *Z. molomo*, but as a variation of the allied *Z. damarensis*, Trim. (Proc. Zool. Soc. Lond., 1891, p. 90, n. 76, pl. ix, f. 17 (♂)). I therefore give here a new description of *Z. molomo*, chiefly from a series of eight examples of each sex collected at Johannesburg, Transvaal, by Mr. Feltham; and below a description of the variation of *Z. damarensis* previously treated as "Variety A" of *Z. molomo*, from examples taken in northern and north-eastern Cape Colony by Mr. Feltham, the late Colonel Bowker, Mr. R. M. Lightfoot, and myself.

Zeritis molomo, Trim.

Exp. al. (♂) 13—15 lin.; (♀) 13—17 lin.

♂. *Orange-yellow, with a very broad costal-apical and broad hind-marginal fuscous border in fore-wing, and a moderately-broad costal-apical fuscous patch and narrow hind-marginal fuscous edging in hind-wing.* *Fore-wing*: fuscous border beginning abruptly on costa a good deal before middle, rapidly widening over all apical area, and crossed, about midway between extremity of cell and apex, by a transverse series of three more or less indistinct spots of the ground-colour lying between subcostal nervure and third median nervule; hind-marginal border of about even breadth from 3rd median nervule to posterior angle, but rather irregular on its interior edge where there are usually slight nervular projections; orange-yellow paler on costal margin from base to beginning of fuscous border. *Hind-wing*: costal-apical fuscous patch commencing only a little before apex, confluent with hind-marginal

narrow fuscous edging as far as radial nervule, but thence separate, suddenly narrowing, and becoming macular and indistinct to its termination below first median nervule. *Cilia* broad, ochrey-yellowish at origin and whitish externally, with rather wide fuscous interruptions on nervules. UNDER-SIDE.—*Hind-wing and costal, apical, and hind-marginal border of fore-wing pale creamy-brownish; hind-wing with 4 transverse series of moderate-sized dull-silvery fuscous-edged spots, and clouded over basal and inner-marginal area, and between third and fourth series of spots, with purplish-brown. Fore-wing*: the following silvery-white-centred black spots, *viz.*:—three disco-cellular (one terminal), one below middle cellular spot (sometimes indistinct), six or seven in an irregular discal transverse series, and six or seven (more faintly marked with silvery-white) in a regular submarginal series; close to hind-margin a regular series of seven minute black spots very slightly edged with orange; inner-marginal border dull creamy, without marking. *Hind-wing*: a sub-basal series of three spots, the middle one in discoidal cell; a pre-median series of three, the middle one in cell; an elongate double terminal disco-cellular spot; two discal irregular and not parallel series, rather close together and almost meeting mesially, of nine spots each; immediately beyond these follows a submarginal whitish suffusion; a hind-marginal series of eight minute black spots, fainter than those in fore-wing.

♀. Similar to ♂, paler in basal areas, especially on costa of fore-wing; three orange-yellow spots of transverse sub-apical series in fore-wing much enlarged and conspicuous, forming a short curved submacular narrow stripe united to orange-yellow field on 3rd median nervule, and except for a very narrow junction on costa dividing broad costal from apical part of fuscous border. *Hind-wing*: fuscous markings less developed, the costal-apical patch being confluent with thin hind-marginal edging as far as 2nd subcostal nervule, and the edging itself below that nervule being broken up into five small completely-separated inter-nervular spots. UNDER-SIDE.—As in ♂, but usually rather paler and a little more yellowish in tint.

The position of this species in the *Thyra*-group of *Zeritis*, its resemblance on the upper-side to *Z. aranda*, Wallgrn., but its nearer alliance to *Z. taïkosama*, Wallgrn., and *Z. orthrus*, Trim., as indicated by the under-side markings, were noted in "South-African Butterflies," ii, p. 206. The few examples then known to me were from Kaffraria, Basutoland, the Orange Free State, and Transvaal; but I have since received—besides those from Johannesburg

above mentioned—two ticketed Kimberley in the collection of Mr. C. N. Barker, and a good series taken at Dordrecht in N.E. Cape Colony by Mr. Francis Graham. The latter examples were noted by Mr. Graham as occurring almost exclusively on "kopjes" and elevated spots, and with quite the habits and flight of the allied species. During three years' observation, the insect was found to be really numerous only in the month of October, but occasional specimens were noticed during the later summer months. Mr. Feltham's examples were also taken in October (1901 and 1902) in a hollow on the Witwatersrand hills lying along the north side of Johannesburg; and he writes that the insect in that locality was apparently restricted to a very limited area—possibly that of some special food-plant—and in its short and zigzag flight close to the ground and frequent settling on the bare earth or on stones quite resembled its congeners *Z. aranda* and *Z. almeida*, Feld.

ZERITIS DAMARENSIS, Trim. (Plate XIX, figs. 5, 5*a*, 5*b*.)
Zeritis damarensis, Trim., Proc. Zool. Soc. Lond., 1891, p. 90, n. 76, pl. ix, f. 17 (♂).
VARIETY.—*Zeritis molomo*, Trim., "Variety A (♂ and ♀)," S.-Afr. Butt., ii, p. 206 (1887).

In my description of this butterfly in 1891 (*l. c.*) I had only three examples of the ♂ before me and no ♀. The main features distinguishing it from *Z. molomo*, Trim., were noted as (1st) much larger size; (2nd) paler and more restricted orange-yellow of upper-side, the basal areas being widely-obscured with ochreous-fuscous; and (on under-side) (3rd) a whitish suffusion on costa of fore-wing, and over base and upper median area of hind-wing; (4th) submetallic spots of hind-wing whiter but not so bright; and (5th) the outer discal series of spots in hind-wing more remote from the inner one and more regular. To those features characteristic of the under-side of the hind-wing should be added the absence of the purplish-brown clouding in the basal and inner-marginal areas and between the two discal series of spots, so conspicuous in *Z. molomo*; as well as the absence of the first spot in the pre-median series; while as regards the upper-side of the hind-wing, there is a remarkable difference in the shape and position of the costal-apical fuscous patch, which is prolonged not inferiorly and submarginally as in *Molomo*, but towards centre of wing, ending abruptly just at extremity of discoidal cell.

VARIETY.—♂. *Differs from type-form in the great reduction or almost entire suppression of the ochreous-fuscous clouding over basal areas,* especially as regards hind-wing. UNDER-SIDE.—Whitish suffusion above costal nervure of fore-wing, and over base and upper median area of hind-wing much fainter.

♀. *Basal areas free from clouding, and but slightly paler orange-yellow than rest of ground-colour; costal-apical patch smaller, not extending base-ward; sometimes ill-defined or even obsolescent;* inner edge of hind-marginal border more or less strongly dentated or pierced by rays of the ground-colour (rarely extending to hind-margin itself). *Hind-wing: costal-apical patch very variable, often much reduced, and sometimes obsolescent.*

In this form the ♂, though variable in size, varies but very little in the dark costal and hind-marginal borders; but the ♀, on the contrary, presents very slight variation in size, while the dark markings range from development scarcely less than in the ♂ to all but entire suppression. The extreme in this direction is reached by two ♀ ♀ taken at Kimberley by Mr. Feltham, in 1887 and 1891 respectively, where the dark markings are represented solely by a series of small inter-nervular spots (party obsolete in hind-wings), and in the fore-wing by a very limited cluster of fuscous scales just before apex, and by another just above and before posterior angle. Examples almost as devoid of dark markings as these are a ♀ from Kimberley in the collection of Mr. H. Grose Smith, and another taken at Springbokfontein, Namaqualand, by Mr. R. M. Lightfoot, in October 1890.

The distribution of this *Zeritis* seems to be mainly in the dry upland regions of South Africa. The type-form was taken by Mr. A. W. Eriksson in North-Eastern Damaraland (Omaramba-Oamatako), while the slight variety here noted has been met with in northern Cape Colony from west to east, *vid.*: by myself at Komaggas, Namaqualand, in 1873, and by Mr. R. M. Lightfoot in seven different localities in Namaqualand during 1890; by the late Col. Bowker, myself, and Mr. Feltham on the Vaal River and at Kimberley, at different dates; Pella, on the Orange River, in 1894 by Mr. G. Alston; and between Somerset East and Murraysburg, also by the late Col. Bowker. At the same time the receipt of a ♀ taken by the late Mrs. Monteiro at Delagoa Bay shows that the species in suitable localities extends to the coast-line.

In flight and ground-loving habits there does not seem to be any noticeable difference between this *Zeritis* and its immediate congeners. It has probably two broods in the year, as my own and Mr. Lightfoot's specimens were captured in the months of August, September, and October, but Mr. Alston's in April and May. The typical examples from Damaraland were taken by Mr. Eriksson in January.

Genus Lycæna.

Lycæna lerothodi, n. sp. (Plate XIX, fig. 6.)

Exp. al. (♂) 15—15½ lin.; (♀) 15½—16½ lin.

Allied to *L. letsea*, Trim., and *L. methymna*, Trim.

♂. *Very dark brown, but with a decided bronzy gloss*; without marking, except (in fore-wing) a very faint transverse terminal disco-cellular fuscous line; cilia grey generally, but white at and for a little below apex in both wings. Under-side.—*Yellowish-brown*; common to both wings—a terminal disco-cellular sub-reniform dark-brownish whitish-ringed spot; an irregular discal series of rather small dark whitish-ringed spots; a submarginal series of dark spots inwardly bounded by white marks (which are strongly lunulate in hind-wing); a waved interrupted white line (indistinct in fore-wing) parallel and close to hind-margin; and cilia basally white but terminally brown throughout. *Fore-wing*: basi-inner-marginal area paler and greyer than general surface; discal series of spots curved inwardly from 3rd to 1st median nervules, but the lowest (6th) spot situated nearer to hind-margin than the 5th. *Hind-wing*: all markings stronger and better defined than in fore-wing; a sub-basal transverse row of three very distinct round black white-ringed spots; two quite similar spots stand respectively first and last of the discal series (quite as in *L. methymna*), but the other (6) spots of the series are brown and form a curve similar to that shown in fore-wing (without any tendency to become confluent as in *Methymna*).

♀. Like the ♂, but with the brown of the upper-side not so dark, and the terminal disco-cellular mark in fore-wing less indistinct.

This *Lycæna* differs from *L. letsea*—a native of the same territory—in its larger size, much darker upper-side, want of anal-angular yellow lunules in the hind-wing, and (on the under-side) much deeper yellow ground-colour, fainter and more curved discal series of spots in the fore-wing, and conspicuous development of the inner submarginal series of white lunular markings. In the two

characters last mentioned *L. lerothodi* shows some resemblance to *L. methymna* (some specimens of which are also almost as dark on the upper-side), but is widely separated by its unvaried (except at apices) cilia, and the yellow tinge of the under-side with its much more constricted discal markings.

Described from 3 ♂ ♂ and 3 ♀ ♀,* in the British Museum (Natural History), received from Mr. R. Crawshay, in a collection of butterflies made by him in Basutoland in the years 1901–2. From Mr. Crawshay's detailed labels attached to the specimens, I find that these six examples of *L. lerothodi* were all taken on the Machacha, the highest mountain in the Maluti range, a ♂ and a ♀ having been secured at each of the following elevations, *vid*: 9,000, 9,500, and 10,000 feet, on the 29th, 30th, and 31st January, 1902, respectively.

Family PAPILIONIDÆ.

Subfamily *PIERINÆ.*

Genus Colias.

Colias electra (Linn.). (Plate XX, figs. 7—7*d*.)

Papilio electra, Linn., Syst. Nat. (ed. xii), p. 764, n. 101 (1767).

♂, ♀. *Papilio hyale*, Cram., Pap. Exot., iv, pl. cccli, ff. E, F [♂], G, H [♀], (1782).

♀ Var. *Papilio palæno*, Cram., *op. cit.*, pl. cccxl, ff. A, B (1781).

♂, ♀, ♀ Var. *Colias electra*, God., Enc. Meth., ix, p. 102, n. 39 (1819).

Of this abundant South-African form, variable in the male and exceedingly variable in the female, I wish to record a singularly pale *Aberration* of the ♂ from Natal, and a highly remarkable melanic one of the ♀ from Cape Colony.

Aberration.—♂. *Ground-colour of upper-side* (*and also that of under-side of fore-wing*) *very pale dull yellowish-creamy, with a greyish-tinge in hind-wing*; central spot in hind-wing very dull pale orange-yellow. On under-side the hind-wing and the costal and hind-

* Two of these examples have lost the fore-legs, but from the features presented by the abdomen and wings, there can be little if any doubt that they are ♀ ♀.

marginal borders of the fore-wing very pale greenish with a tinge only of yellow.

This example furnishes a striking contrast to the normal deep orange-yellow ♂ *Electra*—the more so as it wants the pink or violaceous-pink surface-lustre—and recalls to some extent the appearance of the pale dimorphic form of the ♀. The markings on both surfaces are normal.

Mr. C. N. Barker took this specimen at Malvern, near Durban, Natal, and most liberally presented it to me with the rest of his South-African Lepidoptera in 1898.*

Aberration.—♀. *Ground-colour of upper-side (as well as that of under-side of fore-wing) replaced by dull fuscous*, which exhibits, however, the normal violaceous surface-lustre ; the darker borders and disco-cellular terminal spots obscurely indicated. On under-side the hind-wing and a more limited than usual apical area in the fore-wing are of a very dingy olivaceous-greenish ; central silvery marking in hind-wing rather small but conspicuous ; other spots obsolete or obsolescent. In size this ♀ is only $1\frac{1}{2}$ in. across the expanded fore-wings,—over 4 lin. below the average.

Mr. R. M. Lightfoot, of the South-African Museum, wrote to me in February 1902 about an extraordinary "bluish-black" *Colias* taken near Cape Town, by Mr. A. Duncan ; and this is the example here described, which has been forwarded to me by the captor through Mr. Feltham. The last-named correspondent informs me that Mr. Duncan took it at Groote Schuur, on the slopes of the Devil's Peak above Rondebosch in August 1901, and that he had heard of the capture there by another gentleman of a second similar example at about the same time.

To afford a clear appreciation of the nature of these two Aberrations, I give figures of *C. electra* (♂ and both forms of ♀) from Natalian specimens collected at Malvern near Durban by Mr. C. N. Barker, which are good average representatives of the species, except that the second (pale) form of ♀ is larger than usual, expanding $3\frac{1}{4}$ in. Hitherto *Electra* has remained unfigured, except by the rough delineations of Cramer published 120 years ago ; and the illustrations now given will render much plainer the characters in which the butterfly agrees with or differs from its

* In 1894 I was shown at Cape Town a somewhat similar ♂ said to have been recently taken in the suburb of Rondebosch. The specimen was much rubbed on the upper-side, but retained sufficient scales to show that it had been of a singular pallid tint resembling that of the second form of ♀.

near allies, *C. edusa*, Fab., and *C. fieldii*, Ménétr. The extent to which *Electra* ranges northward from South Africa is still very imperfectly known; but *Edusa* from the north certainly extends as far southward as Lake Nyassa, and all the Tropical-African specimens I have seen do not differ from European examples except in the deeper more orange-yellow tint of the males; while those I have recently received from Kisumu, British East-African Protectorate, were also quite devoid of the distinctive marks of *Electra*, *vid.*: the pink-violaceous gloss (much stronger in the ♂), and the heavy basal fuscous suffusion in the ♀.

In reference to the melanic Aberration above described, I may remark that the only other *Colias* I have seen which exhibits any marked tendency to melanism is a ♂ *C. hyale* (L.) in the British Museum. In this example, which is ticketed "Vesubie Valley, Nice (2,000 ft.)," both fore-wings are for the greater part rather thinly suffused with fuscous —the portions not suffused being the base, costal border to beyond middle, and inner-marginal border almost to posterior angle—the suffusion being denser at extremity of discoidal cell; the yellow spots on the hind-marginal border are faint and ill-defined. On the under-side the fuscous suffusion in the fore-wings is much more limited, prevailing only about extremity of cell and a little beyond, but there is at the same time a very sparse sprinkling of fuscous scales generally; and in the hind-wings there is a rather wide median suffusion of ferruginous-red. It is of interest to find that, according to Staudinger (Cat. Lep. Palæarct., 1901, p. 17), the aberration of *C. hyale* from Sarepta named *nigrofasciata* by Grumm-Grshimailo is not unlike the Nice example here described, his note of it being "*al. ant. vitta nigra discoidali.*"

Family HESPERIIDÆ.

Subfamily *PAMPHILINÆ*.

Genus Kedestes.

Kedestes tucusa (Trim.). (Plate XX, figs. 8, 8*a*.)

Pyrgus tucusa, Trim., Trans. Ent. Soc. Lond., 1883, p. 359; and S.-Afr. Butt., iii, p. 297 (1889).

Kedestes tucusa, Watson, Proc. Zool. Soc. Lond., 1893, p. 96.

This species, whose intermediate position between *K. mohozutza* (Wallengr.) and *K. chaca* (Trim.) is fully defined by me *loc. cit.*, is only known to me as occurring in the upper districts of Natal and in Transvaal. The examples from those countries (received from Mr. J. M. Hutchinson and Mr. H. Barber respectively) were unaccompanied by any notes of the habits of the butterfly; and I am very glad therefore to be able to supply this deficiency from the interesting data now given by Mr. Feltham, who has sent me from Johannesburg a ♀ taken on 18th February, 1894, and two ♂♂ and a ♀ taken on the 15th and 19th March, 1903. He writes:—"This species is a slow flyer and easily caught, either on the wing or at rest on the long stalks of the Tambookie grass, among which, on the two occasions I have found it, it flew. Like *Chaca*, it sits with closed wings, as far as my observation goes. Both stations where I found it were on the slopes of the Witwatersrand hills. It seems to be very local, being confined to limited areas of grass, like so many other butterflies, while the veldt for a long distance round *appears* to be equally suitable. No doubt food-plant or some other condition not noticed affects this habit."

In the smaller of the two ♂♂ forwarded by Mr. Feltham, the under-side varies in wanting, except for the very faintest tinge, the ordinary pale-fulvous colouring of the hind-wings.

Explanation of Plate XIX.

Fig. 1. . *Acræa rahira*, Boisd., ♂. (Grahamstown, Cape Colony.) Page 231.
1*a*. . Aberration, ♂. (Johannesburg, Transvaal.) Page 232.
1*b*. . Aberration, ♂. (Johannesburg, Transvaal.) Page 232.
2, 2*a*. *Zeritis Felthami*, n. sp., ♂ and ♀. (Retreat, Cape Peninsula.) Page 233.
3, 3*a*. *Zeritis thysbe* (Linn.), Variety, ♂ and ♀. (Muizenberg, Cape Peninsula.) Page 236.
4, 4*a*. *Zeritis molomo*, Trim., ♂ and ♀. (Johannesburg, Transvaal.) Page 238.
5, 5*a*. *Zeritis damarensis*, Trim., Variety, ♂ and ♀. (Kimberley; and Ookiep, Namaqualand; respectively.) Page 240.
5*b*. . Aberration, ♀. (Kimberley.) Page 241.
6. . *Lycæna lerothodi*, n. sp., ♂. (Machacha, Basutoland.) Page 242.

Explanation of Plate XX.

Fig. 7, 7*a*, 7*b*. *Colias electra* (Linn.), ♂, ♀, and pale dimorphic ♀. (Malvern, Natal.) Page 243.

7*c*. . . Pale Aberration, ♂. (Malvern, Natal.) Page 243.

7*d*. . . Melanic Aberration, ♀. (Cape Town.) Page 244.

8, 8*a*. . *Kedestes tucusa* (Trim.), ♂ and ♀. (Johannesburg Transvaal.) Page 245.

XII. *A Revision of the Sub-family* Pelidnotinæ *of the Coleopterous family* Rutelidæ, *with descriptions of new genera and species.* By the late Frederick Bates. Communicated by Gilbert J. Arrow, F.E.S.

[Read March 2nd, 1904.]

It has been a sad satisfaction to me to prepare for publication this last fruit of the devoted labours of one of the most exact and conscientious of British entomologists. Although compressed into a very small compass, this Revision of a difficult group of beetles represents many months of constant and strenuous investigation, continued to within a very few days of my friend's death. It was the author's intention to somewhat extend the dimensions of the paper, but although, when conscious that it was not in his power to fulfil his purpose, he committed it to me to deal with at my entire discretion, I have thought it best to make only such additions as were absolutely necessary to fit it for publication. With the exception therefore of a very few additions to, and consequent slight modifications of, the synoptic tables, necessary to render them complete, and the description of one new genus proposed by Mr. Bates for a species of my own, I have confined myself to a purely editorial function.

The types of the new forms described in the paper are now in the British Museum Collection, with the exception of three unique specimens in the Royal Museum at Brussels. Gilbert J. Arrow.

The great accumulation of new forms, in every family of the Coleoptera, since the publication of Lacordaire's great work, the "Génera des Coléoptères," has had the natural result of necessitating a revision of the classification and composition of the groups, as given in that work.

In the following paper I have endeavoured, to the best of my means and ability, to accomplish this for the sub-family *Pelidnotinæ*. The leading character given by Lacordaire to distinguish his "*Pelidnotides*" from his "*Rutelides vraies*" is:—the thorax entirely margined at the base.

As second to this in value he gives the relatively smaller and wider scutellum, usually more or less rounded behind. On the other side he separates it from his "*Areodides*" by the clypeus being confounded with the front. Singularly enough he has included the genera *Heterosternus* and *Macropoides* in his "*Pelidnotides*," notwithstanding the fact that both these genera have the clypeus distinctly separated from the front by a well-marked suture. These, together with the genus *Parisolea* (unknown to Lacordaire), were erected into a new sub-family—the *Heterosterninæ*—by H. W. Bates in the "Biologia Cent. Amer., *Lamellicornia*," p. 286, on account of the clypeus, which differs from that of the "*Rutelides vraies*" in being well separated from the front, and of the "*Areodides*" in being quite differently formed. Dr. Ohaus has confirmed this arrangement in his "Revision der Heterosterniden," and has enriched it by his new genus *Homoiosternus*. This and *Heterosternus* have the base of the thorax fully margined in the ♀, the margin sometimes effaced at the middle—in front of the scutellum—in the ♂: in the genera *Parisolea* and *Macropoides* the base of the thorax is completely immarginate. It is much more difficult to find characters that will enable one at once to distinguish the "*Pelidnotides*" from those "*Rutelides vraies*" having the tarsal claws all entire, for there is no single character sufficiently constant to enable us to do this: nevertheless we shall not go far wrong if we attend to the following characters in combination. In the "*Rutelides vraies*" the scutellum is larger, and longer than wide*; the base of the thorax is always immarginate, and more or less parabolically emarginate from the median lobe to the hind angles, the median lobe being arcuately emarginate, or truncate, in front of the scutellum: and the mesosternal process is massive and frequently elongated.

In the *Pelidnotinæ* the scutellum is generally rather

* The only exceptions known to me are the species *cærulea Perty*, and *lauta Burm.* of Burmeister's genus *Chalcentis*; in which the scutellum—although quite disproportionately large—is very distinctly wider than long, with the apex either pointed or narrowly rounded. As Lacordaire has pointed out, these two species are generically distinct from the third species—*victima Burm.*—included by Burmeister in the genus. As this latter species forms the first division of the genus, it must, I presume, take the generic title of *Chalcentis*: in which case I propose the generic title of *Microrutela* for the other two.

small, very rarely a little longer than wide,* or pointed at apex: the base of the thorax is well and entirely margined † in the great majority; moderately bisinuate, with the median lobe more or less broadly rounded behind (*Pelidnota quadripunctata* being the only exception known to me): and the mesosternal process (where present) is sometimes very small, never very large.

Having, as I hope, cleared the way to a better understanding of the position and limits of this sub-family, I will now offer one or two remarks as to its composition.

Perhaps the most remarkable and exceptional members are the two new genera having a feathery (not membranous as in the *Anomalinæ*) fringe to the outer borders of the elytra; nevertheless—exceptional as this character is—in every other respect they are clearly true members of the sub-family. Another very exceptional form is the *Pelidnota quadripunctata* (already alluded to), which points to a close relationship with the genus *Rutela*.

A peculiarity in the form of the hind tibiæ in the ♂ of certain *Pelidnotæ* has led me to elevate them to generic rank.

The genus *Pelidnota* consists of a rather large number of species, with characters so involved as to make the endeavour to bring them into anything like systematic order, whilst at the same time preserving, as far as possible, the grouping of those species having a common facies, a difficult one: I have nevertheless attempted it—in a tabular form—and give it for what it is worth; it may, perhaps, serve for a time.

I must here make my most emphatic and grateful acknowledgments to my good friend Mr. Gilbert J. Arrow (of the Natural History department of the British Museum), to whom I am indebted for great and always cheerfully rendered assistance, without which it would have been impossible for me to have completed this task.

Chiswick.

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* In some species of *Plusiotis*, and in some individuals of *Chrysina erubescens*.

† Totally immarginate in three known species of *Pelidnota*; and partly (at the middle) immarginate in some species of *Plusiotis*, and others.

Table of the genera of Pelidnotinæ.

A. (♂) Inner spur to hind tibiæ very slender, elongate and hooked at the apex: abdomen concave down the middle . . . . . *Odontognathus*, Lap.

A.A. (♂) Inner spur to hind tibia never very slender, elongate or hooked at the apex: abdomen not concave down the middle.

B. Elytra without a feathery fringe at outer border.

C. Outer claws all entire.

D. Prosternal process developed.

E. (♂) Hind legs not much elongated or conspicuously differing from those of ♀.

F. Mandibles deeply excised outwardly, appearing as if bidentate.

G. (♂) Hind tibiæ simple, gradually widening from the base . . . . . *Pelidnota*, MacLeay.

G.G. (♂) Hind tibiæ having the inner basal edge arcuately emarginate . . . . . *Mecopelidnota*, n. gen.

F.F. Mandibles entire, or only feebly sinuated at outer edge . . . . . *Plusiotis*, Burm.

E.E. (♂) Hind legs strongly developed and differing from those of ♀.

a. Mandibles entire at outer edge.

α. (♂) Hind tibia not prolonged: hind tarsus much shorter than tibia and its outer claw simple and slender *Chrysina*, Kirby.

β. (♂) Hind tibia prolonged and acuminate at apex: hind tarsus much longer than tibia and its outer claw broadly toothed at inner margin . . . . . *Chrysophora*, Serv.

a.a. Mandibles notched at outer edge.

b. (♂) Hind tibiæ strongly compressed.
c. (♂) Hind tibiæ toothed at upper margin: hind tarsi very long . . . *Chalcoplethis*, Burm.
c.c. (♂) Hind tibia not toothed at upper margin: hind tarsi less elongate . . . . . *Epichalcoplethis*, n. gen.
b.b. (♂) Hind tibia very stout, but not strongly compressed . . . . . *Aglycoptera*, Sharp.
D.D. Prosternal process wanting . . *Homonyx*, Guér.
C.C. Outer claws all widely cleft . . . *Lasiocala*, Blanch.
B.B. Elytra with a feathery fringe to outer border.
a. Pro- and meso-sternal processes well-developed . . . . . *Hoplopelidnota*, n. gen.
a.a. Mesosternal process wanting . . *Xenopelidnota*, n. gen.

Table of the species of the Genus PELIDNOTA. †

A. Base of thorax not margined, the median lobe truncated in front of the scutellum . . . . . *quadripunctata*, n. sp.
A.A. Base of thorax margined (except in *lucida* and *cupritarsis*), the median lobe always rounded behind.
B. Pygidium with a distinct rounded depression, or strongly impressed line at extreme apex, which is strongest in the ♀ . . . . . *rostrata*, Burm. (*viridana*, Blanch.)
B.B. Pygidium without depression, or impressed line, at extreme apex. ‡
C. Clypeus with the front margin more or less strongly excised at the middle in both ♂ and ♀, the excision always narrower and deeper, and the clypeus more narrowed and recurved, in the ♀.

† The names of all species unknown to me have a prefixed *.
‡ With a single exception only—in the ♀ of *P. bivittata*, Swed.

a. (♂) Hind tibiæ and tarsi very rarely much incrassated, the hind outer claw simple and slender.

b. (♀) Sutural angle of elytra not prolonged.

c. Elytra with a short grey scale-like hair arising from each puncture . . . . *granulata*, Gory.

c.c. Elytra without short scale-like hairs.

d. Pygidium entirely—and more or less thickly—clothed with decumbent hairs.

sp. 1. Elytra irregularly punctured and rugose . . *rugulosa*, Burm.

sp. 2. Elytra with regular rows of deep punctures, which are here and there elongated, or confluent . . . . . *aciculata*, n. sp.

sp. 3. Elytra strongly and regularly striated; the intervals closely punctured, and irregularly transversely rugulose . *Kirschi*, n. sp.

Elytra very lightly striated, the striæ somewhat regularly and finely punctured; the intervals very finely punctured and here and there transversely rugulose . . . . . *var.*? *tenuistriata*, m.

sp. 4. . . . . **rubriventris*, Blanch.

sp. 5. Elytra irregularly and very finely seriate-punctate: the intervals unequal and delicately punctulate . . . . *dubia*, n. sp.

sp. 6. Entirely dark metallic-green; elytra nearly

smooth; hind legs thickened in the ♂ . *Belti*, Sharp.

d.d. Pygidium scantily clothed with short decumbent hairs at the sides and base only; the apex always smooth and shining in the ♂; in the ♀ the pygidium is *entirely*—and closely—transversely aciculate (*acutipennis*), or aciculate-rugulose (*glaberrima*); the apex being smooth and shining in the remaining species.

e. Sutural apex of elytra acutely produced: bronzed-green, metallic, elytra nearly smooth . *acutipennis*, n. sp.

e.e. Sutural apex of elytra simple.

a. Unicolorous.

sp. 1. Bronzed-green, metallic, showing castaneous in some lights; thorax nearly smooth . . . *glaberrima*, Blanch.

sp. 2. Very bright metallic green, reflecting castaneous; thorax with a few very distinct punctures . . . . . *cupripes*, Perty.

sp. 3. Testaceous, with metallic green lustre . . . . **testaceovirens*, [Blanch.

a.a. Not unicolorous.

β. Thorax with pale lateral margins.

sp. 1. Shining purplish-castaneous; elytra smooth. *purpurea*, Burm.

sp. 2. Shining dark purplish, nearly smooth; the ♂ with obscure darker markings; the ♀ variegated with pale yellow guttæ . . . . . *xanthospila*, Germ.

sp. 3. Smooth, pale yellow, shining, with a dark metallic green band

across both elytra (typically) . . . . *pulchella*, Kirby.

sp. 4. Brilliant golden testaceous, with an oblique green stripe down each elytron; finely irregularly seriate-punctate . *vittipennis*, n. sp.

sp. 5. Elytra with distinct lines of punctures, mostly effaced at the base and apex; brilliant pale luteous, with dark spots, etc., on the thorax, and dusky patches on the elytra: these latter sometimes absent . . *gracilis*, Gory.

sp. 6. Elytra very distinctly seriate-punctate, the intervals irregular and some of them subcostiform: metallic dark green, with irregular pale yellow stripes, usually interrupted behind the middle . . . . . *liturella*, Kirby.

β.β. Thorax without pale lateral margins, elytra deeply striate, brick-red: thorax blue-black . *rufipennis*, Wat.

b.b. (♀) Sutural angle of elytra triangularly prolonged; elytra strongly costate . . . . . *nitescens*, Vigors.

a.a. (♂) Hind tibiæ and tarsi very strongly incrassated; the hind outer claws widened, and sinuate —or broadly toothed—along the lower edge.

f. (♂) Hind trochanters not prolonged behind. Elytra nearly smooth, shining castaneous-green; a testaceous dorsal band —broad and irregular at base— and a marginal, uniting with the dorsal at the apex . . . . . *tibialis*, Burm.

f.f. (♂) Hind trochanters prolonged behind forming a large lobiform process . . . . . *bivittata*, Swed. (*vitticollis*, Burm.)

C.C. Front margin of clypeus entire, or emarginate, in the ♂ : always entire in the ♀.

g. (♂) Hind legs never strongly incrassated ; the hind outer claw simple and slender.

h. Thorax not margined at the base. *lucida*, Burm.—*cupritarsis*, H. W. Bates.

h.h. Thorax margined at the base.

i. Sutural apex of elytra acutely produced, or distinctly spinose.†

j. (♂) Pygidium entirely and closely aciculate-rugose, the apical part sometimes also punctate ; rather thinly clothed with short decumbent hairs (except in *punctulata*) . . . . . *notata*, Blanch.—*chiriquina*, n. sp.—*punctulata*, H. W. Bates.

j.j. (♂) Pygidium with the apical part polished, smooth, or with scattered punctures, without short decumbent hairs : frequently vertical behind . . . . . *virescens*, Burm.—*strigosa*, Cast.—*prolixa*, Sharp.—*Lucæ*, Lec.—**lugubris*, Lec.—*costaricensis*, H. W. Bates.—*punctata*, Linn.—?**polita*, Lat.

i.i. Sutural apex of elytra simple.

k. (♂ ♀) Pygidium entirely and closely aciculate-rugose and covered with short grey decumbent hairs. (♂. Clypeus sinuate, or feebly emarginate, in front) . . . *unicolor*, Drury.—**bonariensis*, Burm.

† In the division *i* the clypeus (with individual exceptions in *punctulata*) has the front margin entire in the ♂.

k.k. (♂ ♀) Pygidium without short decumbent hairs, frequently tumid, setose at sides and apex; usually smoother and more or less punctate at the apex in ♂.

l. (♂) Pygidium bicolorous, the sides dark (usually green), the middle (rarely the apex only) pale, tarsi pale.

m. (♂) Front of clypeus entire, narrowly rounded, or pointed, and more or less reflexed, or recurved; the side margins distinctly sinuate † . . . . . *paraguayensis*, n. sp.—*Championi*, n. sp.—*fulva*, Blanch.—*ancilla*, n. sp.—*pallidipennis*, n. sp.

m.m. (♂) Front of clypeus either sinuate or distinctly emarginate, the side margins scarcely sinuate ‡ . . . . . **lævissima*, Burm.—*fracida*, n. sp.—*cayennensis*, n. sp.

To this division belong probably all those bewildering forms, *prasina*, Burm.; *æruginosa*, L.; *glauca*, Oliv.; *alliacea*, Germ.; *herbacea*, Bl.; *luridipes*, Bl.; *chlorana*, Er. It is impossible at the present time to distinguish these by the quite inadequate descriptions.

l l. (♂) Pygidium unicolorous: tarsi black or dark metallic.

a. Thorax of normal form, without median groove.

β. Testaceous. *chalcothorax*, Perty.—*sordida*, Germ.

β.β. Metallic green . . . . *cyanipes*, Kirby.

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† In the ♂ the last abdominal segment is polished and nearly glabrous, with the sides—and often the hind margin—testaceous; in the ♀ it is duller, paler, roughly, and entirely, sculptured, concolorous with the pygidium; altogether in strong contrast to the other—smoother and much darker—segments.

‡ In some cases the front of the clypeus of the ♂ is so feebly sinuate as to be almost entire, but it is generally broader and less reflexed. The last abdominal segment is usually testaceous at the sides in the ♂; in the ♀ it is very rarely paler than the other segments, but is much more strongly and closely sculptured.

a.a. Thorax very short, sulcate down the middle, side margin uniformly curved . . . . *Chevrolati*, Sol.

y.y. (♂) Hind legs strongly incrassated; the hind outer claw widened and sinuate—or broadly toothed—at the lower edge.

n. (♂) Clypeus entire in front, the margins all lightly reflexed: elytra not ridged along the base.

sp. 1. (♂) Clypeus narrowly rounded in front (parabolic); thorax with a large rugged fovea at each side which extends to the anterior border † . *sumptuosa*, Vigors.

sp. 2. (♂) Clypeus broadly —and subsinuately —rounded in front: thorax with a small round fovea at each side . . . . . *cyanitarsis*, Gory.

sp. 3. . . . . **Langsdorfi*, Mann.

sp. 4. . . . . **emerita*, Ol.

n.n. (♂) Clypeus emarginate in front, all the margins strongly recurved: elytra ridged along the base.

(♂) Pilosity of pygidium short, sparse, grey, and decumbent: of the ♀ coarser, and forming a tuft at the apex. *ignita*, Oliv.

(♂) Pilosity of pygidium long, coarse, and of a rusty-red colour: of the ♀ dense, silky, and of a pale golden colour . . . . . *var. chamæleon*, [Herbst.

I know not where to place the following species:—

fuscoænea*, Blanch.—metallica*, Cast.—**Osculati*, Guer.—**sybarita*, Harold (*sumptuosa*, Cast.).

† A like fovea is found in *P. nitescens*.

I am indebted to Mr. G. J. Arrow for the following information:—

Pelidnota venezuelensis, G. and H. (*versicolor*, Lat.), is the same as *Rutela tricolor*, Guer., a true *Rutela*, and Latreille's name must supersede that under which it is catalogued.

P. tricolor, Nonfr., is a var. of *P. sumptuosa*, Vigors.

P. bimaculata, Cast., is *Hoplognathus maculatus*, Gory.

P. versicolor, Bilb., is of doubtful position; but, in all probability, will not come under *Pelidnota*.

Pelidnota quadripunctata, n. sp.

♀. Testaceous-yellow, moderately shining; head and thorax slightly darker: clypeus rather strongly narrowed to the front, which is lightly notched in the middle, all the margins black and reflexed: head and thorax moderately punctured; the latter widest behind the middle, its base immarginate, the median lobe narrow, truncate in front of the scutellum, rather strongly emarginate at each side the lobe: a dusky mark at each side near the margin, at about the middle: scutellum wider than long, the sides bordered with dark green: elytra extremely delicately shagreened, minutely and sparsely punctulate; widest—and a little angulate—before the middle; from this point to the apex—and also by the suture—the margin is of a dark purplish-brown; a dark spot at the shoulder, and a dark oblique spot near the apex; pygidium dark bronzy-green, rather finely and closely aciculate-rugulose, thinly setose at sides and apex, which is rounded: under-side and legs bronzed-green: front haunches, and the antennæ, dark castaneous; sides of breasts and of abdomen rather thinly pilose: metasternum and sides of abdomen rather coarsely rugose-punctate; last abdominal segment somewhat strongly transversely rugose: mandibles strongly notched outwardly; mesosternal process rather long and robust.

Long. 22 mm. Lat. 6 mm.

Hab. Cayenne.

A single ♀ of this very distinct species is in the Royal Museum at Brussels.

Remarkable in the present genus by the form and immarginate condition of the base of the thorax, the truncated median basal lobe, etc., showing affinities in the direction of the genus *Rutela*. The transverse, and smaller, scutellum, however, distinctly points it out as a *Pelidnota*.

P. aciculata, n. sp.

♀. Elongate, narrow, pointed both in front and behind : head and thorax bronzy-brown, feebly shining ; clypeus elongate, moderately narrowed to the front, the apex rounded, slightly notched at the middle and recurved, rather strongly and closely rugose-punctate : thorax strongly but not very closely punctured on the middle ; more closely and rugosely at the sides : widest at about the middle, front angles prominent and acute, the hind sub-obtuse ; base very broadly lobed, strongly margined, scarcely as wide as base of elytra : scutellum wider than long, coppery-brown, with bright green margins, sparsely punctulate : elytra ridged along the base, a little widened to behind the middle, testaceous-brown, moderately shining, the sutural apex sub-spinose, each elytron with 9 regular rows of deep punctures, which are frequently elongated, or confluent, and are of a lustrous greenish colour at the bottom ; there are besides 2 or 3 short irregular converging rows near the shoulder, between the 5th and 6th rows, and another short basal one between the 1st and 2nd rows, by the suture : pygidium greenish, thinly clothed with short decumbent hairs ; closely, and rather strongly, aciculate-rugose, without setæ at sides and apex, this latter narrowly rounded : under-side very sparsely pilose, and, with the legs beneath, shining bronzy-green ; legs above coppery-green : tarsi bright purplish-coppery : 5th and 6th abdominal segments elongate, closely transversely rugose : prosternal process large, the mesosternal long, moderately robust, rounded at apex.

Long. 22 mm. Lat. 10 mm.

Hab. CAYENNE.

A single ♀, also in the collection of the Royal Museum of Brussels, bearing a label of Candèze with the name here adopted.

P. Kirschi, n. sp.

Oblong-ovoid, a little depressed, bronzed-brown, moderately shining : head, thorax and scutellum distinctly tinged with green or coppery.

♂. Head lightly depressed, moderately punctured : clypeus rather strongly—but not angularly—emarginate in front, the angles rounded, and—together with the side margins—moderately reflexed, closely but finely and scarcely rugosely punctured : thorax widest at about the middle, median basal lobe broad ; densely, and a little rugosely, punctured at the sides, much more lightly on the middle, which shows traces of a smooth median line : scutellum with the sides curvilineate, lightly punctulate : elytra a little

widened behind the middle, each with 9 entire strongly impressed striæ, which are here and there punctured; intervals very distinctly, but moderately, punctured, and here and there transversely rugose; coarsely rugose behind the shoulders: pygidium concolorous with the elytra, very delicately and closely rugulose, evenly and entirely clothed with short decumbent hairs, with the usual longer setæ at sides and apex; gradually declivous to the apex, which is rounded: under-side shining bronzed-green, sides of breasts and of abdomen thickly clothed with long yellowish hairs, nearly smooth in the middle; last abdominal segment short, smooth on the middle: legs dark blue; tarsi cyaneous; antennæ dark blue.

♀. Form more elliptic: clypeus longer, more deeply and subangulately notched, and more reflexed in front; the elytra less tinged with green, the intervals more strongly punctured and rugose, the sutural apex acute; the pygidium longer and more gradually declivous; the last abdominal segment long and entirely aciculate-rugulose.

Long. ♂. ♀. 25–26·5 mm. Lat. max. 13–13·75 mm.

Hab. Colombia.

I have received this species from numerous sources, all with the name adopted. It appears to be rather common.

Var. (?) *tenuistriata*.

♀. Differs from *P. Kirschi* in having the upper surface decidedly more coppery and more shining, sides of clypeus green, the rest of the head bright coppery: the puncturation—especially of the elytra—finer; the striæ very faintly marked, and distinctly evenly and finely punctured: clypeus with the notch in the front margin less deep, not at all angulate, and less reflexed in front: the femora tinged with green on the under-side; the tibiæ more chalybeate, the tarsi chalybeate-green; the under-side more coppery, the last abdominal segment less strongly sculptured, with the sides nearly smooth.

Long. 27·5 mm. Lat. 13·5 mm.

Hab. Venezuela (St. Ines).

A single ♀ only: further specimens will be needed to determine its rank more positively.

P. dubia, n. sp.

Oblong, a little depressed; shining pale golden-testaceous, more or less tinged with green.

♂. Clypeus strongly notched in front, the angles rounded and reflexed; strongly and rather densely rugose-punctate: head coppery-green, with the usual depression, moderately and not closely punctured: thorax widest—and subangulate—at the middle, median basal lobe broad; very finely and sparsely punctured on the disc, more strongly and closely at the sides: scutellum a little wider than long, feebly punctulate: elytra but little widened from the base, very faintly seriate-punctate, the intervals irregular, very delicately and not closely punctulate; the post-humeral rugosities not strong: pygidium entirely clothed with rather long greyish hairs, and entirely aciculate-rugulose, gradually declivous behind, the apex rounded: under-side and legs shining coppery-green, tarsi brilliant coppery-green: sides of breast and abdomen clothed—but not thickly—with long hairs: 4th and 5th abdominal segments delicately—but not at all closely—aciculate, the last segment short and smooth: antennæ testaceous, the club a little infuscate.

♀. Clypeus a little more—and sinuately—narrowed anteriorly, a little more deeply notched and more strongly reflexed in front; thorax more strongly punctured, the sides a little sinuate behind the middle: elytra more distinctly seriate-punctate; abdomen not at all coppery, the segments—especially 4–6, more strongly and closely aciculate-rugose.

Long. 19·5—22 mm. Lat. 9·75—11·75 mm.

Hab. Colombia (Caucathal).

Some examples are more uniformly testaceous, with but very slight green reflections.

It is possible this may be the *P. testaceovirens*, Blanch., but the author of that species gives the length as 23—24 mm. and the pygidium as "*dense striolata*" without any mention as to its being pilose or not.

P. acutipennis, n. sp.

♀. Oblong-ovoid, dark metallic bronzed-green, with slight purplish reflections: clypeus sinuately narrowed to the front, which is lightly notched in the middle, and strongly reflexed, closely and finely punctured: head sparsely and finely punctured, the angular depression well marked: thorax finely and thinly punctured on all its surface, with several shallow foveæ near the sides, side margins reflexed; widest at about the middle, thence a little sinuately narrowed to the base; median basal lobe very distinct: scutellum minutely punctulate: elytra moderately convex, but little widened behind, the sutural apex acutely produced; ridged along the base, humeral callus rather strong, with a well-marked depression on the inner side; very

minutely and distantly punctulate, with traces of seriate punctures: pygidium shining, gradually declivous, delicately and entirely, transversely and closely, aciculate-rugulose, with a few setæ at the sides and a tuft at the apex, which is rather narrowly rounded: metasternum coppery-green and clothed with long shaggy hairs; abdomen shining bronzed-green, coppery along the hind margin of the segments, closely and very finely aciculate-rugulose and scantily pilose at the sides, smooth on the middle, the last segment closely and entirely aciculate-rugulose: legs bright purplish-coppery, tarsi bronzed-green: antennæ fusco-testaceous.

Long. 23 mm. Lat. 11 mm.

Hab. Venezuela (Merida).

P. vittipennis, n. sp.

♂. Oblong-ovoid, brilliant golden testaceous, with strong bright green reflections, especially on head and thorax: clypeus strongly, but not angulately, notched and strongly reflexed in front, closely punctured: head finely and thinly punctured, rather strongly depressed: thorax widest—and rounded—at the middle, basal lobe broad; very sparsely and finely punctate, with a few larger punctures and several faint foveæ at the sides: scutellum not wider than long, minutely punctulate: elytra widened behind, excessively minutely and not at all closely, punctulate, with here and there a few more distinct and seriate punctures: a broad oblique vitta extending from the shoulder to near the apex, and a shorter narrower one apically, by the suture; these vittæ, when viewed obliquely, are of a shining green colour: pygidium very delicately and closely aciculate-rugulose, except the apex which is smooth and testaceous; a few short scattered decumbent hairs at the sides and along the base; less gradually declivous than in any of the preceding species, with the apex broadly rounded: under-side and legs shining green, a little brassy on the abdomen; sides of breast and of abdomen thinly pilose, closely and finely punctured; the last ventral segment transversely aciculate-rugulose along the base; tarsi cyaneous with the claws greenish; antennæ green, the club a little infuscate.

♀. Sides of the clypeus sinuately—and more strongly—narrowed to the front, which is more deeply notched, and more reflexed: elytra more parallel, distinctly but confusedly punctured down to the suture, seriately punctured at the sides: pygidium less convex and more naked: last ventral segment more strongly and entirely sculptured.

Long. ♂. 24 mm. ♀. 21·5–24 mm.

Lat. ♂. 12 mm. ♀. 10–11·25 mm.

Hab. Brazil (Jatahy, Province of Goyas).

P. chiriquina, n. sp.

♂. Elongate, subelliptic, rather depressed, testaceous with green reflections: clypeus rounded and entire in front, margins lightly reflexed, densely and finely punctulate, and reticulately rugulose, with strong green reflections: head moderately punctured, more coarsely and a little rugosely at the sides: thorax widest just behind the middle, hind angles obtuse, front angles rather prominent and acute, median basal lobe narrow, finely and not at all closely punctured on the disc, with smaller punctures between; at the sides very delicately closely and reticulately rugulose-punctulate; front and hind borders vivid green: scutellum a little wider than long, testaceous-green, faintly punctulate: elytra a little paler and less shining than the thorax, somewhat abruptly declivous behind, basal border not ridged, widest at about the middle, suture green, the apex toothed; the entire ground surface very delicately shagreened, very sparsely and minutely punctulate, with a few irregular faintly impressed, and vaguely punctured, striæ; and here and there transversely rugulose: pygidium green, rather convex, subvertical; delicately aciculate-rugulose-punctulate, the apex a little smoother, and rounded; thinly but entirely clothed with short decumbent hairs, with the usual setæ at sides and apex: under-side, and the legs beneath, shining green; legs above purplish-castaneous with green reflections; tarsi bluish-castaneous: metasternum, and sides of abdomen (broadly), rather thinly pilose; disc of abdomen smooth, the last segment feebly punctured at the sides.

♀. Larger, broader, more expanded behind, than in the ♂: head dull coppery-green, and more coarsely sculptured: clypeus longer, narrower and more recurved in front; the side margins scarcely reflexed: thorax with coppery and green reflections, the rest as in the ♂: elytra with the impressed lines, etc., still more vague: pygidium without short decumbent hairs, closely and entirely granulose-rugose, not convex, gradually declivous, with the apex narrowly rounded: abdomen with a row of setose punctures across the segments, the last segment transversely aciculate-rugulose at the sides and along the base.

Long ♂. 26 mm. ♀. 30·5 mm. Lat. ♂. 14 mm. ♀. 16·5 mm.

Hab. Panama (Chiriqui).

I have received this species from the Continent, under the name I have adopted. In the ♀ specimen the elytra are acute but somewhat retracted at the sutural apex, which, however, I regard as an *individual* character only, as in *P. costaricensis* and *punctata* there are individuals—

both ♂ and ♀—as above described or normal, with the apex simple, acute, or spinose.

P. parayuayensis, n. sp.

♂. Ovoid, convex, chestnut-brown, moderately shining ; clypeus strongly and sinuately narrowed to the front, which is rounded, entire and recurved ; closely rugose punctate ; head not closely punctured, the triangular depression well marked : thorax evenly rounded at the sides, widest at the middle, distinctly but not very closely punctured over the entire surface, a submarginal dark-greenish spot at each side, the front and hind borders reflecting green, median basal lobe well marked : scutellum wider than long, sparsely punctulate, the margins reflecting green : elytra expanded behind, the sutural apex simple or acute ; finely, very irregularly, and not at all closely, punctured, and here and there rugulose ; there are also—especially down the disc—a few vaguely impressed lines, which are irregularly punctured ; post-humeral rugosities very faint; a dark spot at the shoulder, and another (always faint, and sometimes wanting) near the side, a little behind the middle : pygidium with the sides dark green, the middle testaceous ; convex and rapidly declivous, very delicately aciculate-rugulose on the disc, more strongly at the sides, the apex smoother and thinly punctate ; apex subtruncate : under-side shining, greenish : mesasternum entirely punctured, densely so at the sides, which are also pilose : abdomen smooth and metallic down the middle, the last segment smooth, and testaceous at each side : legs shining castaneous, the femora little tinged with green : mandibles very strongly excised outwardly and projecting beyond the clypeus : prosternal process rather small, the mesosternal short, strongly compressed, subvertical in front.

♀. Form more broadly ovoid, less convex, and less shining : clypeus but little differing from that of ♂ : thorax less convex, less rounded at the sides, widest behind the middle, the puncturation stronger ; front and hind borders—and borders of scutellum—not reflecting green : elytra much more distinctly punctate-striate, the dorsal intervals subcostate : pygidium not convex, gradually sloping to the apex, which is narrowly rounded, entirely testaceous-brown, entirely and closely aciculate-rugulose : abdomen dark bronzed-green with purplish reflections (especially at the hind border of the segments), duller than in the ♂, and distinctly punctured ; the last segment of the same colour and sculpture as the pygidium.

Long. ♂. 21·5–22 mm. ♀. 23 mm. Lat. ♂. 12 mm. ♀. 13 mm.

Hab. PARAGUAY.

I have frequently received this species, with the name I

have adopted; but I believe it has not hitherto been described. It forms one of a small group of species (the *fulva* group) from Paraguay, Argentina, etc., having a common facies, the clypeus short and narrowly rounded and entire in front in both ♂ and ♀, and the last ventral segment in strong contrast to the others, in colour and sculpture.

P. Championi, n. sp.

♂. Very near to the preceding, but larger, less convex, more oblong, paler, and usually more polished (as if varnished); head more finely punctured; clypeus a little broader in front, with the sides more sinuate, less coarsely but more densely rugose-punctate: sides of thorax less regularly rounded, widest about the middle, thence sinuately narrowed to the base; the front and hind margins—and margins of scutellum—not at all green; a distinct dark brown submarginal spot at each side of thorax: elytra still more finely punctured, but the dorsal punctured striæ more apparent; on each elytron a somewhat vague—sometimes interrupted—slightly oblique dusky stripe, extending from the shoulder to two-thirds the length of the elytron: pygidium rounded behind: abdomen brilliant dark castaneous without tinge of green, nearly smooth: metasternum entirely punctured, and coarsely but not thickly pilose at the sides: antennæ and legs testaceous, the femora not tinged with green.

♀. Much larger and more oblong than *P. paraguayensis* ♀; the clypeus more prolonged, with the apex more broadly rounded, much more recurved, and the sides more sinuate: sides of thorax not sinuate behind the middle; a submarginal dark spot, and a small round fovea near its inner side: the elytra much less distinctly punctate-striate, with scarcely a trace of costæ or transverse wrinkling: pygidium much more finely aciculate-rugulose, smoother and punctate towards the apex: mesosternal process short, but not so strongly compressed and less vertical in front.

Long. ♂. 24 mm. ♀. 26 mm. Lat. ♂. 13 mm. ♀. 14·5 mm.

Hab. ARGENTINA (Tucuman).

I have great pleasure in dedicating this species to my old friend, Mr. G. C. Champion.

P. ancilla, n. sp.

♂. Oblong, convex; head, thorax and scutellum shining reddish-testaceous; elytra testaceous-yellow, a little less shining than the head and thorax: clypeus short, rounded, entire and reflexed in front,

side margins sinuate and lightly reflexed ; closely but finely rugose-punctate : head thinly punctate, the depression well marked : thorax widest behind the middle, rather thickly punctured on the disc, more closely and coarsely but not rugosely at the sides ; median basal lobe distinct : scutellum not wider than long, sparsely punctulate, narrowly margined with green : elytra but little widened behind, each elytron with 9 rows of very distinct punctures set in lightly impressed striæ, and 2 shorter, 1 between the 1st and 2nd rows, and another between the 5th and 6th rows ; the dorsal intervals convex : pygidium dark purplish-brown at the sides, testaceous on the middle (distinctly defined), finely—especially on disc and at apex—aciculate-rugulose-punctate, convex and rapidly declivous, the apex rounded : under-side dark purplish-brown, almost metallic on the abdomen, the segments green along their upper border, very finely and sparsely punctulate down the middle ; the last segment testaceous at the sides and along the hind border : metasternum closely punctured and finely pilose : legs and antennæ testaceous, with the club of the latter dusky.

Long. 19 mm. Lat. 10·5 mm.

Hab. Brazil (Jatahy, Province of Goyas).

P. pallidipennis, n. sp.

♂. Oblong-ovoid, depressed, moderately shining ; pale testaceous-yellow, the head, thorax and scutellum a little darker, and showing faint greenish reflections : clypeus closely rugose-punctate, strongly and bisinuately narrowed to the front, which is narrowly rounded, entire and strongly recurved : head very lightly depressed, finely and not closely punctured : thorax finely punctured on the disc, the interspaces very minutely punctulate; widest at the middle, median basal lobe well marked, a shallow submarginal fovea at each side: scutellum slightly tinged with green, punctulate : elytra with the ground surface excessively minutely punctulate-rugulose, with larger—but still very small—punctures scattered over the surface, together with five irregular feebly impressed striæ down the disc, and here and there transversely rugulose ; in and between the striæ and extending to the suture—but not reaching the apex—are irregular rows of small pale spots each with a minute black point in the centre : pygidium green at base and sides, testaceous apically (ill-defined), very finely aciculate-rugulose, with a few rather large punctures at the extreme apex, not abruptly declivous, the apex broadly subsinuately rounded : under-side shining green ; sides of breasts and of abdomen (the latter scantily) pilose ; abdominal

segments very thinly punctured in the middle, the last delicately aciculate-rugulose, testaceous at sides and along the hind border : legs—including tarsi—testaceous, the femora with green reflections ; antennæ dusky.

Long. 25·5 mm. Lat. 14·5 mm.

Hab. Brazil.

P. fracida, n. sp.

♂. Ovoid, somewhat depressed, shining, dark testaceous-brown : clypeus greenish in front, rounded and with a slight sinus in the middle, margins lightly reflexed ; closely and very finely aciculate-rugulose-punctate ; head purplish-brown behind, moderately punctured : thorax widest just behind the middle, moderately—and nowhere densely—punctured, the interspaces more closely—and very minutely—rugulose-punctulate ; two or more shallow foveæ at, or near to, the sides ; median basal lobe narrow, its basal margin and a corresponding portion of the anterior margin green : scutellum bordered with green, sparsely and minutely punctulate : elytra almost smooth, the entire ground-surface excessively delicately punctulate-rugulose, with larger—but still minute—punctures scattered over the surface, but disappearing before the apex, also a few faintly impressed striæ, and irregular rows (also disappearing before the apex) of round pale spots with a minute black point in their centre : pygidium moderately convex, rapidly declivous, closely and entirely aciculate-rugulose, dark bronzed-green at the sides, greenish-testaceous on the middle (well-defined) : under-side shining bronzed-green with slight coppery reflections ; sides of metasternum thinly pilose ; abdomen with segments 2–5 finely aciculately-rugulose at the sides, sparsely punctured on the middle, the last entirely rugulose-punctate, with the sides narrowly testaceous : legs shining purplish-brown with green reflections ; tarsi purplish-brown.

Long. 23·5 mm. Lat. 13 mm.

Hab. Brazil (Amazons).

P. cayennensis, n. sp.

♂. Ovoid, somewhat depressed, shining pale testaceous, with the margins of the clypeus, front and hind margins of thorax, scutellum and suture of elytra, green : clypeus trapezoidal, distinctly and widely emarginate and lightly reflexed in front ; finely, and a little rugosely, punctured : head faintly depressed, finely punctured : thorax sub-parabolically curved at the sides, widest a little behind the middle, moderately—and nowhere thickly—punctured, the interspaces as in *P. fracida* ; one or more shallow foveæ at, or near, the sides ; median

basal lobe narrow : scutellum wider than long, smooth : elytra with irregular, faintly-impressed, striæ, which are irregularly—and more or less vaguely—punctate ; there are also two rows of minute, but distinct, black points near the suture, two others (abbreviated behind) on the disc, with others—irregularly placed—between the rows ; the two dorsal intervals a little dusky : pygidium more or less convex and declivous, delicately aciculate-rugulose, the sides and base green, the apex testaceous (not well-defined) : under-side shining greenish-castaneous ; sides of metasternum and of abdomen rather thinly pilose ; middle of abdomen metallic, almost smooth, the last segment very finely rugulose-punctulate, the sides and hind border testaceous : legs and antennæ testaceous.

♀. Form more robust and convex, less shining : clypeus longer, with the front subtruncate (angles rounded) and more reflexed, and the sides sinuate : thorax, head behind, and scutellum, with distinct green reflections : elytra more expanded behind : pygidium less abruptly declivous, entirely dark green, more coarsely sculptured : under-side greener, the 5th abdominal segment well punctured in the middle, the last unicolorous, closely and entirely aciculate-rugulose : legs darker, and more tinged with green.

Long. ♂. 23·25–25.5 mm. ; ♀. 25.5 mm. Lat. ♂. 13 mm. ; ♀. 14 mm.

Hab. Guiana and Venezuela (Manoa).

There are individual differences in colour and brightness of head, thorax, and under-side.

Received from various sources with this name.

Mecopelidnota, n. gen.

♂. Clypeus semicircular, all the margins well and evenly reflexed, front margin entire : mandibles deeply notched externally : eyes large : base of thorax distinctly margined, narrower than base of elytra, the median lobe broad : scutellum wider than long, sides curvilineate : elytra rather abruptly declivous behind, the apical callus large and prominent : pygidium rapidly declivous, convex at apex : hind legs not elongated, their tibiæ abruptly widened internally behind the base, setose on inner face : intermediate tibiæ similarly formed but the emargination smaller : hind tibial spurs long and very acute, especially the inner one : hind tarsi rather slender, the claw joint not incrassated nor toothed beneath, the outer claw widened and sinuated along the lower edge, the extremity very acute ; front outer claw long and moderately stout, its extremity entire and acute : prosternal process small and narrow ; meso-

sternal very short, much compressed, and vertical in front : 5th ventral segment long ; metasternum flat. ♀. Unknown.

The peculiar form of the hind tibiæ will readily distinguish this from any form of *Pelidnota.*

M. Arrowi, n. sp.

♂. Elongate, moderately convex, above entirely dark bronzed-green, shining : head—especially the clypeus—closely and coarsely rugose-punctate, the vertex sparsely punctured ; thorax widest at the middle, thence a little sinuately narrowed to the hind angles, which are not acute nor outwardly directed ; front angles prominent and acute ; side margins reflexed ; the surface broken—especially near the sides—by shallow depressions ; moderately closely punctured on the disc, much more closely at the sides, the punctures rather large : scutellum punctured : elytra very gradually widened to beyond the middle, distinctly transversely ridged at the base, rather strongly rugose-punctate, the punctures becoming seriate near the sides ; humeral and apical calli smooth : pygidium finely and closely aciculate-rugulose, the extreme apex smooth, thinly clothed with fine decumbent hairs, and sparsely setose at sides and apex : under-side and legs metallic-green ; tarsi shining black : metasternum entirely, and abdomen at the sides, pilose : the latter smooth and shining down the middle, the last segment glabrous : antennæ brown.

Long. 25 mm. Lat. 12·5 mm.

Hab. Ecuador (Guayaquil).

[This genus is constituted for the above species and *Pelidnota cylindrica*, Waterh., the only known forms exhibiting the peculiar excision of the posterior tibiæ at the base, with which character is associated an exceptionally narrow cylindrical form. As each is known only by a single male specimen, the generic diagnosis may not be adequate for distinguishing the female, in which the tibia may be expected to be of the normal type. The differences between *Mecopelidnota Arrowi* and *cylindrica* are very slight, and until additional specimens can be compared their value must remain rather uncertain. The type of the new form however is considerably smaller than that of *M. cylindrica*, which was brought from Guatemala, the head especially being relatively less broad. The clypeus is distinctly less transverse and the mandibles are more strongly bilobed. The thorax, on the contrary, is rather more transverse and its sides are more strongly

angulated in the middle. The sculpture is everywhere stronger and closer, especially upon the pygidium, which is also more thickly hairy. The legs are less stout, a difference which is particularly noticeable in the hind femora. Whether this is merely the accompaniment of a reduction in size further specimens must be left to determine. G. J. A.]

Plusiotis cupreomarginata, n. sp.

Size, form, colour, etc. of *P. resplendens*, Bouc., with which it has hitherto been confounded: it differs in having the mandibles either entire, or feebly sinuate, at the outer edge, and less produced in front: the clypeus convex, broader in front, the margins all strongly reflexed; the head depressed above: the sutural apex of the elytra not acutely produced, the outer margins of the elytra brilliant coppery: the mesosternal process shorter: the under-side of a brilliant silvery-green, sometimes with coppery reflections in the ♀: the legs shining coppery, the tarsi tinged with green. Pygidium in the ♂ almost smooth, compressed at the sides, setose at sides and apex, rapidly declivous and rounded behind: in the ♀ it is aciculate-rugose at the sides,* gradually declivous, the apex more narrowly rounded: the last abdominal segment smooth in both sexes.

Long. ♂. 21 mm.; ♀. 23 mm. Lat. ♂. 10·5 mm.; ♀. 12 mm.

Hab. Costa Rica (Carilla).

Chrysina Beckeri, H. W. Bates, cannot possibly remain in the genus *Chrysina*, seeing that the hind legs in the ♂ differ in nowise from those of the ♀ except in being a trifle stouter, with their tibiæ emarginate at the basal edge, and that the metasternum is not at all bulged in this sex. It should, in my opinion, be closely associated with *Plusiotis laniventris*, Sturm., and *P. Woodi*, Horn.

Epichalcoplethis, n. gen.

[This new genus was designed by Mr. Bates for *Pelidnota velutipes*, Arrow, a species forming a connecting link between *Pelidnota* and *Chalcoplethis*. From both of these genera it differs chiefly by the form of the hind legs of the male, of which the tibiæ are broad and compressed, with their upper margins not notched or indented, as in *Pelidnota*, or irregularly produced, as in *Chalcoplethis*, but

* Subject to individual variation in both species.

gently and uniformly curved. There is a rather thick clothing of erect golden hair upon the inside of the tibia, the hairs being longer and more extensive than those similarly occurring in *Chalcoplethis*. The tarsi are slender, and are slightly shorter but not thicker in the female. The hind tarsus of the male has the claw-joint long and very strongly curved and the outer claw is widened and distinctly sinuated at its inner edge.

The clypeus of the male is rather more excised at the tip than in *Chalcoplethis* and the pygidium is uniformly rugose and clothed with hairs only at the base.

Epichalcoplethis velutipes was described from a male specimen, but there are now examples of both sexes in the British Museum. The female differs from the male in having the hind tibiæ simple and only sparingly furnished with hairs on their inner side and in the subacute clypeus. The colour of the species varies from bright green to bronze. The type was brought from Grenada in the West India Islands, but other specimens are from Trinidad, and Dr. Ohaus informs me that it also occurs on the South American mainland. He has suggested that this insect may perhaps be the *Pelidnota metallica*, Cast., one of the species placed by Mr. Bates among the unrecognizable forms. This is certainly not improbable, but the description is so fragmentary that without an examination of the type there can be no sufficient reason even for treating it as a member of the genus *Epichalcoplethis*.—G. J. A.]

Lasiocala Ohausi, n. sp.

♂. Broad, subquadrate; head, thorax, and scutellum, brilliant violaceous, with or without greenish reflections: elytra reddish-violaceous, less brilliant than the thorax: head small, sparsely and finely punctured: clypeus without hairs, short and broad, subtruncate in front with the angles rounded, moderately punctured, all the margins feebly reflexed: thorax ample, sides strongly rounded; front angles not prominent, hind angles broadly rounded; three foveæ near the hind angles, the two outer connected by an impressed line; very finely—and not closely—punctured; between the punctures—especially at the sides—the surface is minutely rugulose-punctulate; base rather strongly bisinuate; the median lobe well marked; scutellum as long as wide, impressed down the middle, entirely and distinctly—but not thickly—punctured; elytra broadest behind the middle, very delicately punctulate-rugulose, with a few

faintly impressed lines; sutural apex acute or not: pygidium violaceous with green reflections, entirely densely and finely rugulose-punctulate, with a few large punctures at the extreme apex; a few setæ at the sides and apex, the latter narrowly rounded: under-side and legs violaceous, tinged with green: breasts clothed—but not thickly—with long pale yellowish hairs: abdomen naked, all the segments rugose-punctate, most delicately so on the middle; the 5th segment but little longer than the 4th: antennæ—except the basal joint—fuscous brown.

Long. 19–21·5 mm. Lat. (max.) 12–14 mm.

Hab. Colombia (Sta. Martha).

Three specimens (all ♂♂) of this species are contained in my own and the British Museum collections.

It is abundantly distinct from *L. fulvohirta*, Blanch., by the naked clypeus, differently formed and sculptured thorax, smoother elytra, the abdominal segments (especially the 5th) shorter and more strongly sculptured, etc.

I have great pleasure in dedicating this fine species to Dr. Fr. Ohaus, our greatest living authority on the *Rutelidæ*.

Hoplopelidnota, n. gen.

♂. Clypeus broadly rounded and entire in front: mandibles somewhat produced anteriorly, the outer margins entire: thorax strongly margined at the base: outer borders of elytra with a feathery fringe: labrum horizontal, broadly and deeply emarginate at the middle of the front: mentum flattened, or concave, anteriorly, convex behind, front border not emarginate: pro- and mesosternal processes well developed: front outer claws moderately stout, elongate; middle and hind claw-joints with a tooth on the under-side near the base. ♀. Unknown.

This is a *Pelidnota* with the mandibles entire at outer edge, and the elytral border with a feathery fringe. This last character is most exceptional in the sub-family, but is shared by the new genus succeeding.

H. Candezei, n. sp.

♂. Regularly ovoid, shining, dark bronzed-green: clypeus with the margins scarcely reflexed, closely and rugosely punctured; head rather strongly punctured, except on the vertex: sides of thorax rounded from behind the middle, front angles a little prominent, subacute, the hind obtuse; base strongly margined, distinctly lobed

at the middle ; strongly punctured, still more closely and rugosely at the sides : scutellum wider than long, punctured : elytra moderately convex, with vague impressed longitudinal lines and fine scattered punctures, which are larger and subseriate near the suture, coarsely transversely foveate-rugose : sutural apex acute ; the apical callus produced into a short acute spine : pygidium entirely clothed with grey decumbent hairs and a few setæ at sides and apex, closely and finely muricate-rugulose, the apex narrowly rounded : breasts and sides of abdomen rather thickly clothed with long grey hairs ; last abdominal segment feebly punctate on the middle, the apex bisinuate ; the 5th segment long.

Long. 20 mm. Lat. 11 mm.

Hab. CAYENNE.

A single ♂ example in the Royal Museum at Brussels, bearing a label of Candèze, inscribed "*Pelidnota armata.*"

In colour, form, and general aspect, exactly like *Pelidnota granulata.*

Xenopelidnota, n. gen.

♂. Head small, antennæ 10-jointed : clypeus rather short, strongly sinuately narrowed to the front, which is narrowly rounded, entire and recurved ; mandibles narrow, projecting, entire at outer edge : sides of thorax well rounded behind the middle, the hind angles broadly rounded ; strongly margined at the base, the median lobe distinct, and rounded behind : scutellum transverse : elytra ridged along the base, the outer margin with a feathery fringe ; sutural apex simple : a small prosternal—but no mesosternal—process : pygidium nearly vertical, densely, entirely, very finely, and intricately, rugulose ; sparsely setose at sides and apex, the apex rather broadly rounded : breasts pilose, the hairs fine and silky : 5th abdominal segment long : legs moderately robust, but little differing from the ♀, the claw-joints strongly toothed near the base : claws as in *Pelidnota.*

♀. A little larger and of a more regularly ovoid form than the ♂ : clypeus larger, but less sinuate at the sides, and less pointed in front : mandibles broader : sides of thorax less rounded behind the middle, the hind angles less broadly rounded : side margins of the elytra a little explanate from the base to about one-third their length : pygidium more declivous, more delicately rugulose, and less thinly setose at the sides and apex : front (especially) and middle tarsi long and very slender ; the tooth at base of the claw-joints very small, obsolete in the anterior ones.

For this genus it may also be said that it is a *Pelidnota* with the mandibles entire at the outer edge, the elytra with a feathery fringe and the mesosternal process nil: to which may be added the remarkably slender front tarsi in the ♀.

Type, *anomala* (*Plusiotis*), Burm.

XIII. *Observations on the* Dermatoptera, *including revisions of several Genera, and descriptions of New Genera and Species.* By Malcolm Burr, B.A., F.L.S., F.Z.S., F.E.S.

[Read February 3rd, 1904.]

The examination of the fine collection of *Dermatoptera* in the National Museum of Paris has involved the description of a large number of new species and some new genera; I have taken the opportunity of revising a few genera that were in need of revision, and of describing a number of new forms in my own and other collections.

I acknowledge my indebtedness to Sir George Hampson and to Mr. W. F. Kirby for their permission to avail myself of the material in the British Museum, and to describe a few species from that collection.

REVISION OF THE GENUS *DIPLATYS, SERV.*

The examination of a number of specimens of this genus has shown me clearly that several species have hitherto been confounded together, and that the old characters are useless. I have accordingly made a study of the entire genus and drawn up the following synoptical table of the species, based almost entirely on new characters. For the discrimination of the species of *Diplatys* especially, it must be borne in mind that details of colour are worse than useless, and more often misguiding than helpful, though the general system of coloration is valuable, if employed with care.

Doubtless when a larger collection is brought together, this revision will be superseded, though I have been able to examine the types of nearly all the species, but as the characters which I have adopted, namely, the form of the occiput and of the pronotum, group the species according to their geographical distribution, I hope that the new arrangement will be an improvement upon the old.

TABLE OF THE SPECIES.

1. Occiput margine postico carinato-reflexo; (suturis indistinctis; segmentum ultimum tumidum; pronotum postice rotundatum et quam antice angustius, haud longius quam latius; corpus pubescens; species americanæ).
   2. Colore atro . . . . . 1. *severa*, Borm.
   2.2. Colore rufo, nigro-variegato . . 2. *jansoni*, Kirby.
1.1. Occiput margine postico haud reflexo.
   2. Occiput convexum, nec depressum, nec deplanatum, medio nec carinatum nec sulcatum . . . . . 3. *æthiops*, sp. n.
   2.2. Occiput postice plus minus depressum vel deplanatum, carinulatum vel sulcatum.
      3. Pronotum longius quam latius.
         4. Species americana; frons supra labrum tri-impressa; (suturis carinisque distinctis; pronotum antice et postice æque latum) . . . . . 4. *occidentalis*, sp. n.
         4.4. Species africanæ et asiaticæ; frons haud tri-impressa.
            5. Occiput inter oculos late et valde elevatum; parte depressa augusta, transversa, media sulcata . . . . . 5. *conradti*, sp. n.
            5.5. Occiput inter oculos haud vel vix elevatum; parte postica depressa magna.
               6. Occiput margine postico bicarinulatum . . . . 6. *viator*, sp. n.
               6.6. Occiput margine postico sulculatum.
                  7. Statura robustiori; minus pubescens; pronotum lateribus parallelis, ovale; forcipis bracchia basi valida et dilatata et deplanata,

tum attenuata, sensim incurva . . . . . 7. *macrocephala*, Beauv

7.7. Statura graciliori ; valde pubescens ; pronotum lateribus rectis, postice convergentibus, postice quam antice angustius ; forcipis bracchia recta, subcontigua, basi haud valde dilatata, sensim attenuata et acuminata . . 8. *raffrayi*, Borm.

3.3. Pronotum latius quam longius vel æque latum ac longum.

4. Pronotum lateribus parallelis, antice et postice æque latum.

5. Color ruber, rufus vel rufo-testaceus.

6. Statura minore (9·5–10 mm.) . . . . . 9. *gerstæckeri*, Dohrn. (= *longisetosa*, Westw.)

6.6. Statura majore (12 mm. ♀) 9a. id. var. *calidasa*.

5.5. Color fuscus, vel rufo-fuscus (Statura majore).

6. Abdomen segmento ultimo angulis exterioribus rectangulis ; forceps intus denticulatus . . . . . 10. *rufescens*, Kirby.

6.6. Abdomen segmento ultimo angulis exterioribus rotundatis; forceps intus inermis . . . 11. *siva*, sp. n.

4.4. Pronotum antice quam postice latius.

5. Color niger, rufo-variegatus. 12. *ridleyi*, Kirby.

5.5. Color fuscus, necnon albo-variegatus.

6. Pronotum lateribus rectis, postice convergentibus ; forceps sensim attenuatus. (Color fuscus, albo-variegatus) . . . . . 13. *nigriceps*, Kirby.

6.6. Pronotum lateribus convexis ; forceps basi validus, tum attenuatus.

7.	Pronotum sutura distincta; elytra nitentia; albo-variegatus . . .	14. *croixi*, sp. n.
7.7.	Pronotum sutura nulla; elytra haud nitentia; color fuscus .	15. *greeni*, sp. n.

Diplatys severa, Borm., and *D. jansoni*, Kirb.

This group is easy to distinguish by the form of the occiput; the two species are very different in appearance, *D. severa* being of a general dull-black colour, whereas *D. jansoni* is blue-black, with brick-red feet and forceps and pronotum, and sometimes the elytra also are varied with red.

Diplatys æthiops, sp. n.

Parva, gracilis, atra, nitida; occiput valde convexum, globosum, læve, suturis carinisque haud vel vix perspicuis; pronotum antice et postice æque latum, sed margine antico medio in collem triangularem productum; corpus vix pubescens; pedes nigri, tarsis pallidioribus; abdomen gracile, segmento ultimo tumido; forcipis bracchia deplanata, recta, conica, inermia, ♂.

Long. corporis . . . 6·5 mm. ♂.
„ forcipis . . . 0·9 „

Hab. ? (1 ♂ in my collection.)

This species is chiefly characterized by the form of the head.

Diplatys occidentalis, sp. n.

Statura minore; colore rufo-testaceo; antennæ (? +) 8 segmentatæ, segmento 1 nigro, 2 nigro, minimo, 3 and 4 rotundatus, testaceis, 5 longiori, fusco, 6–8 elongatis, cylindricis, fuscis. Caput fuscum, medio rufo-maculatum, postice rufo-marginatum; occiput postice depressum; caput postice angustatum; oculi nigri; pronotum ovale, longius quam latius; frons supra labrum triimpressa; pronotum ovale, fulvo-testaceum; scutellum fulvum; elytra rufo-fulva, macula magna basali fusca, vittaque fusca exteriori, ornata; alæ fulvæ, externe fusco vitattæ. Pedes pallido-testacei, femoribus apice infuscatis. Abdomen rufum, lateribus infuscatis; segmentum ultimum magnum, haud valde tumidum, fuscum, medio sulcatum, margine postico medio deplanato; forceps simplex, rectus, conicus, paullo deplanatus. ♀.

Long. corporis . . . 7 mm. ♂.*
„ forcipis . . . —

Hab. West Indies, Granada, Balthasar, 250 feet, 20 v. 95, No. 206, "Came to light." (1 ♀ in B. M.)

The coloration and habitat distinguish this species; it does not agree in form with the South American species *D. jansoni* and *D. severa*, but in appearance more nearly resembles *D. gerstæckeri*.

Diplatys conradti, sp. n.

Caput nigrum; occiput inter oculos valde elevatum, latum, tumidum; parte depressa postica angusta, transversa; antennæ rufæ; pronotum rufum, ovatum, lateribus rotundatis, antice et postice æque latum, sublongius quam latius; elytra et alæ ampla, fusco-violacea; pedes rufo-testacei; abdomen fusco-violaceum, pilis longis obsitum; segmentum ultimum abdominis paullo tumidum, ceteris vix latius; forcipis bracchia rufa, conica, recta, inermia. ♂.

Long. corporis . . . 9·5 mm. ♂.
„ forcipis . . . 0·6 „

Hab. North Cameroons, Joh.-Albrechtshöhe. (1 ♂, Mus. Paris.)

This species is undoubtedly confused in collections with *D. raffrayi* and perhaps with *D. macrocephala*. The form of the occiput distinguishes it from both.

Diplatys viator, sp. n.

Gracilis, niger, vel fusco-violaceus; occiput inter oculos elevatum, et globosum, postice deplanatum et bicarinulatum; pronotum antice quam postice latius, lateribus rectis, convergentibus. Elytra et alæ violaceo-nigra. Abdomen gracile; forcipis bracchia gracilia, recta. ♀.

Long. corporis . . . 12 mm. ♀.
„ forcipis . . . 1.2 „

Hab. Madagascar, Ankazoabo, 1 ♀ (*E. Bastard*, 1902, Mus. Paris); Fernando Po (*L. Conradt*, 1901, Mus. Paris).

The specimen from Fernando Po, which appears to be a male, is broken, and the apex of the abdomen and the forceps are missing, which is unfortunate, as the remainder of the insect is in better condition than the female from Madagascar; I am convinced, however, that the two specimens are one and the same species; they are likely to be confused with *D. raffrayi*, but differ in the form of the occiput.

* The body of the type is unfortunately broken, and so the exact measurement cannot be taken.

Diplatys macrocephala, Pal. Beauv., and *D. raffrayi*, Borm.

These two species are invariably confused in collections, and I doubt whether de Bormans himself accurately appreciated the difference between them; at all events, in his monograph in Tierreich he attempted to discriminate between them by their colours alone, an entirely deceptive method, that is bound to make confusion worse confounded. The colouring of the two species is the same and varies in the same manner. The difficulty is complicated by the apparent dimorphism of the males. The typical male of both species has the last abdominal segment large and tumid, and the forceps stout, strongly flattened, and dilated near the base, and then suddenly attenuated, and incurved; in a male in my collection (ex. coll. de Bormans) from Stanley Pool, Congo, the forceps recall those of typical *Forficula*; the other, and perhaps commoner form, resembles the female, and these are to be mistaken for hermaphrodites. In the synoptical table I have endeavoured to set forth the distinctions as they appear to me.

Diplatys gerstæckeri, Dohrn.

Much doubt has existed as to the relations between *Nannopygia gerstæckeri* and *Diplatys longisctosa*; de Bormans actually retained Dohrn's genus, but it coincides without any doubt with Serville's earlier erection.

At the time of Mr. Green's paper on *D. longisctosa* (Tr. Ent. Soc., 1898, p. 381) I was unfamiliar with Dohrn's species, and so described Mr. Green's insect under Westwood's name (l. c., p. 388), but in a later paper (The Earwigs of Ceylon, Journ. Bombay N. H. Soc., 1901, November, p. 75) I have united the two species. I will again quote a letter from Dr. Kuhlgatz of the Berlin Museum, who kindly examined Dohrn's type for me: "*D. longisetosa* is very closely allied to this species (i.e. *N. gerstæckeri*), but not actually identical with it. *Nannopygia gerstæckeri* is entirely bronze-coloured with black eyes; in *Diplatys longisctosa* the head is black; the forceps increase a little more in thickness from the apex to the base than in *Nannopygia gerstæckeri*; the elytra of the latter are uniform in colour and broader than in *D. longisctosa*, in which the two posterior thirds of the elytra have a long blackish shadowy streak (at least in the two specimens in the

Berlin Museum). Both forms belong to one and the same genus. In structure they scarcely differ at all."

In spite of this de Bormans attempted to keep the two genera distinct. But an examination of a number of specimens shows that the two species run into each other. Dr. Kuhlgatz describes the head as black in *D. longisetosa*, but it is not so in many specimens, as for instance the one figured by Mr. Green (*op. cit.* Pl. xviii, fig. 5).

Hitherto this species has only been recorded from Ceylon and Burmah, but in the Paris collection I find two females from Dardjiling which are so much larger and stouter in build that I first regarded them as a distinct species. But as I can find no structural distinction, I am compelled to regard them as a local race or variety of *D. gerstæckeri* for which I propose the name var., *calidasa*. Their dimensions are

Long. corporis . . . 12–12·25 mm. ♀.
„ forcipis . . . . 1–1·25 „

Diplatys rufescens, Kirb.

In spite of its name, this species falls nearer to the fuscous species than to the red *D. gerstæckeri*. It is most closely allied to *D. siva* n., but differs as noted in the table of species.

Diplatys siva, sp. n.

Statura majore ; colore fusco. Caput fuscum vel fusco-rufum, planum, postice subangustatum, suturis obsoletis; oculi prominuli, nigri ; antennæ 15-segmentatæ, 1 valido, lato, 2 minimo, 3 and 4 quam 2 duplo longioribus, 5 and 6 etiam longioribus, ceteris gracilibus, cylindricis, elongatis ; pronotum capite paullo angustius, fusco-brunneum, necnon costis lateralibus deplanatis pallidioribus, prozona elevata, medio sulculo longitudinali impressa ; metazona deplanata, postice rotundata, paullo supra elytra producta ; scutellum minimum : elytra valde explicata, ampla, lata, tota fusco-brunnea ; alæ valde explicatæ, squamis fusco-brunneis. Pedes graciles, longi, fusco, compressi ; segmentum primum tarsorum ceteris unitis longius. Abdomen gracile, elongatum, fusco-rufum, tuberculis lateralibus distinctis ; segmentum ultimum ♂ vix vel haud deplanatum nec tumidum, globosum, haud attenuatum ; abdomen ♀ breve, alarum apices vix superans, apice attenuatum. Forcipus bracchia ; ♂ pallida, recta, inermia, subcontigua, vix deplanata, apicibus ipsis incurvis ; ♀ fortiora, subdepressa, breviora, contigua, conica, fusciora. Corpus sparsim pallide pubescens. ♂ ♀.

	♂	♀
Long. corporis	15·3 mm.	10–11·6 mm.
„ forcipis	2 „	1 „

Hab. India, Dardjiling (*Harmand*, 2854–90, Mus. Paris, 2 ♂, 3 ♀).

This new species resembles *D. greeni* in appearance, but is larger. Its position is shown in the synoptical table of species; it approaches *D. rufescens*, Kirb., in structure. Its chief distinction from the latter is the shape of the last abdominal segment of the male, in which the exterior apical angles are rounded, whereas in *D. rufescens* they are rectangular. The forceps is entirely without internal denticulation.

Diplatys ridleyi, Kirby.

This is a red and fuscous species that may be confused with *D. raffrayi*, which it replaces in Asia. In addition to the characters attributed to it in the table, the median and transverse sutures of the head are distinct; the space behind the eyes is elevated and keeled. The occiput is not excavated posteriorly, but only slightly sulculated; the legs are normally ringed with black, but I possess a specimen from Mentawei in which the feet are entirely testaceous.

Diplatys nigriceps, Kirby.

This is the white-marked species described by Mr. Kirby from Hong Kong; it is distinct from the Cingalese species described by me under this name (Tr. Ent. Soc., 1898, pl. 389), which requires a new name (v. *greeni*, n. post.).

Diplatys croixi, sp. n.

Statura minore; colore fusco; corpus pilis longis obsitum; occiput convexum, carinis sulculisque vix perspicuis; pronotum æque longum ac latum, antice quam postice paullo latius, lateribus convexis, margine postico toto rotundato. Caput et segmentum primum antennarum nigra; antennæ fusco-testaceæ. Pronotum prozona elevata fusca, metazona depressa albida. Elytra et alæ amplæ, nitentia; scutellum pallidum. Pedes testacei, femoribus tibiisque nigro-annulatis. Abdomen æneo-nitens; forceps conicus, simplex, rufo-fuscus. ♀.

Long. corporis	9 mm. ♀.
„ forcipis	1 „

Hab. Malacca Peninsula, 2 ♀♀ (*Errington de la Croix* et *P. Chapé*, 1899, in Mus. Paris).

This species approaches *D. nigriceps* in colour, but it is nearer to *D. greeni* in structure; it may be easily confused with the former.

Diplatys greeni, sp. n.

Color fuscus, elytris alisque fusco-rufescentibus. Pronotum latius quam longius, antice quam postice latius, lateribus convexis. Abdomen fusco-rufum; segmentum ultimum dorsale nigrum, magnum, quadratum, angulis exterioribus apicalibus angulatis, haud rotundatis; forcipis bracchia ♂ basi vix contigua, valida, ad mediam partem longitudinis subito attenuata, incurva, ♂. ♀ simpla, recta, conica. ♂ ♀.

	♂ ♀.
Long. corporis . . .	8·5–10 mm.
,, forcipis . . .	1–1·9 ,,

Hab. Ceylon, Punduluoya (*Green;* in B. M. and in my coll.).

Diplatys nigriceps. Burr (nec Kirby nec Bormans). Tr. Ent. Soc. London, 1898, p. 389, Pl. xviii, figs. 1–3, Pl. xix, figs. 6–8 and 15. Burr, Journ. Bombay N. H. Soc., 1901, p. 75, Pl. A, figs. 1–3.

This is the species whose post-embryonic development was investigated by Mr. Green, together with that of *D. gerstæckeri*. It is undoubtedly distinct from the *D. nigriceps* of Kirby, from Hong Kong, with which it is confused in collections.

CHALLIA, nov. gen.

Corpus apterum; antennæ graciles, segmento 1 magno, longo, 2 brevi, haud longiori quam latiori, 3 longiori, 4 and 5 subbrevioribus, ceteris sensim elongatis (segmenta 16 restant); caput deplanatum; occiput postice medio sulculatum et utrinque bicarinatum; pronotum quam caput æque latum, subquadratum; mesonotum pronoto latius, humeris carinato-deflexis; metanotum breve, latum, transversum; pedes longi, graciles, femoribus carinulatis, plus minus compressis; abdomen pubescens, ♂ medio constrictum, ♀ cylindricum, segmentis omnibus punctulatis; segmentum ultimum dorsale magnum punctulatum, medio, apud ♂ profunde, apud ♀ minus, sulcatum, margine postico tuberculis 5 globosis, quorum 3 minora, 2 majora, instructo; forcipis bracchia basi

subcontigua; ♂ sat valida, depressa, ante medium carina interna in dentem obtusum sursum spectantem elevata; dehinc magis depressa, subsinuata, aream angustam ellipticam includentia, ante apicem iterum parallela, margine interno denticulata, apice ipso valde incurva, decussata: ♀ recta, parallela, cylindrica, gracilia, prope basin margine interno minute crenulata, paullo ante apicem denticulatis, nonnullis acutis armata, apice ipso tantum incurva, decussata.

This remarkable genus is very closely allied to, and perhaps even identical with, *Anataëlia*, Bolivar, from the Canaries, which, until now, has been regarded as an isolated aberrant form. But for some years I have had a solitary female in my collection from Korea, which I was unable to describe without the male. It approaches *Pygidicrana* somewhat superficially, but the form of the antennæ and thoracic plates distinguishes it at once from the *Pygidicranidæ*, as well as from the *Karschiellidæ* of Verhoeff.

Challia fletcheri, sp. n.

Fusco-rufescens; pedes testacei, fusco-lineati; dorsum testaceum, fusco-variegatum, vel totum-fuscum; forcipis bracchia basi testacea, tum fusca. ♂ ♀.

	♂	♀
Long. corporis . . .	15 mm.	. . . 14·51–16 mm.
,, forcipis . . .	5 ,,	. . . 4·5–5 ,,

Hab. China, Wei-hai-wei, Len-kung-tan, ix, '98, 1 ♀ (*T. B. Fletcher*, in my coll.); Da-laen-suen, 1 ♂ (*J. J. Walker*, 93–52, B. M.); Tung-yun, 1 ♀ (*J. J. Walker*, 93–52, B. M.); Tamaon Id (*J. J. Walker*, 2 ♀ ♀, 92–196). (The first two also bear the numbers 100344 and 10344 respectively, and the last two bear the numbers 7519.)

NOTE ON THE GENUS *BORMANSIA*, VERHOEFF.

This remarkable genus was erected and characterized by Verhoeff (*Über Dermapteren*, Zool. Anzeig. Nr., 665, 1902), and has hitherto remained only known by this description. But I found a fragmentary male in the Paris collection, and six fragments from Kilimandjaro, from which I have been able to piece together two or three fairly complete specimens, of *B. impressicollis*, so that I can describe the male, as Verhoeff only knew the female. The two species (*B. africana* is the other) are closely allied, it

appears, but *B. africana* is much more hairy than *B. impressicollis*.

The male of *B. impressicollis* has the last abdominal segment very large and round, and smooth, armed at each corner of the posterior margin with a kind of long and blunt tongue-shaped tooth; the forceps are very stout and powerful, the branches strongly thickened and dilated at the base; the inner margin is strongly denticulated, and the left branch is incurved more strongly than the right, as in *Anisolabis maritima*; each branch is armed, near the base, on the upper margin, with a strong, sharp, vertical tooth. The antennæ are characteristic of Verhoeff's family *Karschiellidæ*, to which this genus is assigned; in *B. impressicollis* the first segment is very large and dilated, the second very small, the third a little shorter than the first; the nine following segments are dark, very small, globose; there appear to be at least twenty-five segments, of which the last nine or ten are more slender and conical; the basal half of the antennæ are noticeably thick and strong. In the British Museum there is a single male of a third species, from the Transvaal, which will be described elsewhere.

It is to be noted that according to Verhoeff, the nymphs of *Bormansia africana* have segmented cerci, as in *Diplatys*; the cerci have fifteen or sixteen segments, of which the basal one forms the forceps of the imago.

TOMOPYGIA, nov. gen.

Antennæ segmentis 23 vel plus instructæ; elytra perfecte explicata; alæ deficientes; scutellum triangulare vel vix perspicuum; pedes longi, graciles, femoribus haud incrassatis, quam tibiæ longioribus; segmentum ultimum abdominale magnum, latum, quadratum; pygidium semilunare, verticale; forcipis bracchia ♂ sat valida, basi remota, incurva, paullo ante apicem attingentia, recta, contigua, intus dentata, apice decussata.

Typus generis: *Cylindrogaster abnormis*, Borm.

This genus was originally erected in manuscript by my friend M. de Bormans, for the remarkable earwig described by him in 1883 as a very distinct form of *Cylindrogaster*; in his monograph (Tierreich, Forf., p. 23, 1900) he ranges it in *Pygidicrana*. The collection of the Paris Museum contains a fragment, only the anterior half of the body, but this is so characteristic that I hardly hesitate to

describe it as new, and range it here, though the form of the abdomen and forceps is not known.

TABLE OF SPECIES.

1. Innitidus ; scutellum magnum, pronotum æquans ; elytra brevia, nigro-brunnea ; femora anulata . . . . 1. *abnormis*, Borm.
1.1. Nitidus ; scutellum haud perspicuum ; elytra longiora, æneo-nitentia; femora unicoloria . . . . . 2. *sinensis*, sp. n.

Tomopygia sinensis, sp. n.

Rufo-brunnea ; caput pallidum, tumidum, oculis fulvis ; antennæ segmento 1 magno, conico, obtuso, 2 minimo, 3 longiori, 4, 5, 6 minimis, ceteris sensim longioribus ; (segmenta 22 restant). Pronotum quadratum, quam caput æque latum, antice rectangulum, postice rotundatum, lateribus parallelis ; prozona elevata, metazona depressa ; lateribus paullo reflexis, pellucidis, rufo-brunneum, linea impressa pallidiori ornatum. Scutellum haud vel vix distinguendum. Elytra ampla, longiora quam latiora, minutissime punctulata, rufo-brunnea, æneo-nitentia, margine apicali rotundata, ab humeris apicem versus carina elevata instructa ; alæ desunt. Pedes unicolores, flavi, longes, graciles, femoribus haud incrassatis, quam tibiæ longioribus, vix crassioribus ; tarsorum segmentum primum ceteris unitis longius, subtus valde pubescens ; ungues pulvillo nullo. Abdominis cylindricum, rufo-brunneum, tuberculis lateralibus nullis ; segmenta 7 prima minutissime margine postico fortius, punctulatis. Segmentum ultimum . . . ? Forceps . . . ? Sexus . . . ♂ ?

Long. corporis . . . 2 mm.
„ elytrorum . . 3 „
„ fem. post. . . . 4 „

Hab. China, Pekin, mountains (*A. David*, 941–72, Mus. Paris).

Although the apex of the abdomen, together with the forceps, is missing, I do not hesitate to describe this as a new species. It is very distinct from *T. abnormis* (Java), the only other known species of the genus.

TABLE OF SPECIES OF *FORCIPULA*, BOLIVAR.

1. Forceps intus inermis. . . . . 1. *walkeri*, Kirby.
1.1. Forceps intus dentatus.
2. Abdominis segmenta 3 basalia lateribus crista spinulosa ornata . . . . 2. *americana*, Borm.

2.2. Abdominis segmenta nonnulla spinosa, haud cristata.
3. Segmenta 2–5 abdominis utrinque spinis binis armata . . . . . 3. *decolyi*, Borm.
3.3. Segmenta nonnulla abdominis lateribus utrinque spinis singulis armata.
4. Forceps ♂ sensim incurva, haud constrictus.
5. Segmentum 6 inerme ; species africanæ.
6. Segmenta 2–4 spinosa. Forcipis bracchia bidentata . 4. *congo*, Burr.
6.6. Segmenta 2–5 spinosa. Forcipis bracchia unidentata. 5. *gariazzi*, Borelli.
5.5. Segmenta 2–6 spinosa ; species americana . . . . . 6. *quelchi*, sp. n.
4.4. Forceps primum parallelus, deinde constrictus.
5. Segmenta 2–4 spinosa.
6. Elytra alæque rugulosa. . 7. *tarsata*, Westwood.
6.6. Elytra alæque lævia . . 8. *trispinosa*, Dohrn.
5.5. Segmenta 2–5 spinosa.
6. Pedes unicolores . . . . 9. *pugnax*, Kirby.
6.6. Pedes testacei, et infuscati . 10. *quadrispinosa*, Dohrn.

Forcipula quelchi, sp. n.

Statura majore ; nigra ; pronotum quadratum ; elytra et alæ rugulosa ; abdomen segmentis 4, 5, 6 spinis parvis obtusis rectis armatis ; segmentum ultimum dorsale lævius, medio impressum ; forcipis bracchia triquetra, valde elongata, sensim incurva, haud constricta, margine interno medio dente forti acuto armata. ♂.

	♂
Long. corporis . . .	23·7 mm.
,, forcipis . . .	18·8 ,,

Hab. British Guiana (1 ♂, *Quelch*, 89–127, in B. M.).

This is the second known American species of the genus ; it differs entirely from *F. americana* in the colour of the elytra and in having spines, but not a spined crest, on the sides of the basal abdominal segments. It more nearly approaches *F. quadrispinosa*, Dohrn, but differs in the not constricted forceps, the smaller abdominal spines, and in its habitat.

Labidurodes nitidus, sp. n.

Ater, nitidus, lævis; caput convexum; antennæ segmentis 14; segmentis 8–11 et 14 nigris, ceteris pallidis, 2 minimo, 3 longo, 4 and 5 brevia, rotundata, ceteris elongatis. Pronotum quadratum, antice quam postice paullo angustius, margine antico subrotundato. Elytra ampla, apice truncata; alæ prominentes; pedes breves; femora valde incrassata; tibiæ apice pallidæ; tarsi pallidi, segmento primo cetera 2 unita longitudine æquanti, 2° minimo, haud lobato. Abdomen cylindricum, segmento tertio tuberculo laterali magno instructo; segmentum ultimum angustum, declivum. Pygidium haud perspicuum. Forcipis bracchia paullo remota, recta, triquetra, valida, conica, apicem versus sensim attenuata atque incurva, apice decussata, inermia. ♀

Long. corporis . . . 19·2 mm.
„ forcipis . . . 1·5 „

Hab. MADAGASCAR, "Région du sud-est, Vallée d'Ambolo, Forêt de Fitana." (*Ch. Alluaud*, 1901, 1 ♀, Mus. Paris.)

This specimen appears to be a true *Labidurodes*, but has fewer segments in the antennæ than the typical species; otherwise it agrees with the generic characters. It is very considerably smaller than the only other known species, *L. robustus*, Borm., from New Guinea.

Carcinophora waddyi, sp. n.

Parva, fusca; caput convexum, atrum, nitidum; antennæ 13 segmentis, typicæ, fuscæ, segmentis 1–3 pallidis; pronotum quadratum, nigrum, lateribus pallidis; elytra perfecta, pronoto longiora, fusco-testacea; alæ deficientes; pedes pallidi, femoribus tibiisque fusco-annulatis; abdomen fusco-testaceum, tuberculis lateralibus haud perspicuis; segmentum ultimum dorsale angustatum, margine postico medio impresso; forcipis bracchia contigua, conica, sat gracilia, sensim incurva, attenuata, apice decussata rufo-testacea. ♀.

Long. corporis . . . 7·4 mm.
„ forcipis . . . 1·3 „

Hab. MARTINIQUE (1 ♀, *Waddy*, No. 14, Mus. Paris).

Differs from *C. robusta*, Scudd., by its much smaller size and slenderer build; from *C. boliviana*, Borm., by the elytra, which are half as long again as the pronotum.

Anisolabis gaudens, sp. n.

♂. *A. lætæ*, Gerst., vicina ; statura minori, robusta ; atra, nitida, glabra: caput rufum, clypeo oculisque nigris ; occiput margine postico macula indistincta fusca ornatum ; antennarum segmenta 15 restant, 1 longo, rufo, 2 minimo, 3 longo, rufescenti, 4 and 5 longioribus, nigris, ceteris elongatis, nigris. Pronotum oblongo-quadratum, sulculo medio per meso- et metanota producto instructum ; pro-, meso- et metanota atro-nitentia ; elytrorum vestigia nulla ; pedes breves, robusti, rufi, femoribus apice tibiisque basi læte nigro-annulati ; tarsis ferrugineis, subtus pilosis : abdomen venterque tota atro-nitentia, minutissime vel vix punctulata ; venter subtus pallido-pilosus ; segmentum ultimum dorsale magnum, latum, læve, haud sulcatum ; forcipis bracchia robusta, conica, subrecta, inermia, subcontigua, triquetria, rufo-nigra. ♀ ignota.

	♂
Long. corporis . . .	17 mm.
„ forcipis . . .	3 „

Hab. India, Bhoutan, Pedong, 1 ♂ (*R. Oberthur*, 1897 ; Mus. Paris).

This species approaches *A. læta*, Gerst., and *A. dubronyi*, Kirb. The antennæ are unicolorous, the forceps simple, the head red, but it differs in the darker colour, stouter build, shorter feet, which are broadly banded with dark brown, and the shorter and thicker forceps. The black pronotum distinguishes it from *A. rufescens*, Kirb.*

Anisolabis albovittata, sp. n.

Nigra, pronoto postice albo-limbato : statura minore : caput valde convexum, globosum, suturis haud perspicuis, oculis minimis : antennæ testaceæ, unicolores : pronotum postice quam antice latius, prozona globoso-elevata ; metazona, præsertim angulis posticis, deplanata, alba : elytra nulla : femora valde incrassata, nigra, genubus pallidioribus ; tibiæ tarsique fusco-testacei : abdomen nitidum, læve ; segmentum ultimum dorsale magnum, læve, haud tuberculatum : forcipis bracchia valida, subcontigua, recta, conica, inermia. ♂.

* I take this opportunity of correcting an error in another paper of mine. In the Ann. Mag. N. H. (7), xi, 1903, p. 272, in distinguishing the two species, *A. læta* and *A. dubronyi*, I have inadvertently transposed their localities. *A. læta* is of course the West African species, and *A. dubronyi* is from Tenasserim.

	♂
Long. corporis . . .	6 mm.
„ forcipis . . .	0·3 „

Hab. MADAGASCAR, "Région du sud-est, Vallée du Fanjahira, Isaka (forêt)," 1 ♂, Dec. 1901. (*Ch. Alluaud*, Dec. 1901, Mus. Paris.)

A curious little species, with some superficial resemblance to an ant; it is characterized by the globular head, with obsolete sutures, and the elevated prozona of the pronotum, and depressed and white metazona.

Brachylabis malgacha, sp. n.

Nigra, sericeo-nitida, pilis brevissimis fulvo-auratis tota tomentosa. Caput nigrum, oculis haud prominulis; frons inter antennas media bi-impressa; antennæ 15 segmentatæ, nigrescentes, apicem versus pallidiores; segmento 1 longo, apice incrassato, 2 minimo angusto, 3 parvo, quam secundo duplo longiri, 4 quam 3 breviori, 5 quam 3 tam longo, ceteris gradatim longioribus et angustioribus. Pronotum oblongo-quadratum, capite sesquilongius, margine antico capite haud latius, lateribus paullo divergentibus, margine postico subrecto, quam margo anticus paullo latiori, angulis rotundatis; convexum medio transverse impressum, lateribus ipsis deplanatis et paullo reflexis. Mesonotum margine antico quam pronotum æque latum, margine postico recto, subangustiori, lateribus carina subarcuata distincta instructum. Metanotum mesonoto paullo latius, margine antico recto, lateribus rectis, carinis nullis; margine postico profunde rotundato-emarginato. Pedes longi, graciles, præsertim postici; femoribus tibiisque nigrescentibus, genubus paullo pallidioribus; tarsi graciles, elongati, fulvo-pubescentes, toti testacei, segmento primo ceteris unitis vix longiori, 2 elongato, quam tertium vix breviori. Abdomen convexum, medio paullo dilatatum; plicis lateralibus segmenti secundi haud, segmenti tertii maxime distinctis; abdomen apicem versus attenuatum, segmento ultimo angusto, declive. Forcipis bracchia basi subcontigua, basi incrassata, recta, dehinc gracilia, ♂ valde, ♀ sensim, incurva, apicem versus graciliora, apicibus ipsis acutissimis, decussatis. ♂ ♀.

	♂	♀ (after de Bormans).
Long. corporis . . .	11 mm.	12 mm.
„ thoracis . . .	4 „	5·75 „
„ forcipis . . .	2 „	2·75 „
„ femor. post. . .	3 „	
„ tib. post. . . .	2·5 „	

Hab. MADAGASCAR, "centre de l'île" (*de Bormans* MS., ♀ ♀ in Coll. Dohrn, and Coll. Brunner, No. 1530); DIEGO SUAREZ, 1 ♂ (*Ch. Alluaud*, Mus. Paris).

Among the unpublished notes in manuscript of my late friend M. de Bormans, I find the description of the female with a drawing; the two specimens which were his types are both females, and he did not know the male, of which I find a single specimen in the Paris collection; there seems to be little difference between the sexes; the branches of the forceps are more strongly curved in the male. In his notes, de Bormans writes, "Cette espèce est très voisine de *Br. nigra*, Scudder; elle ne s'en distingué que par sa taille, le prothorax plus long, la forme du penultième segment ventral, la teinte nullement verdâtre. Mais c'est surtout la différence extrême d'habitat qui m'empêche de la confondre avec cette espèce." The Paris specimen is carded, and so the ventral surface cannot be examined; the following is from the description of de Bormans:—

"Penultième segment ventral en arc d'éllipse transversal; non seulement il recouvre complètement le dernier segment ventral, mais il le déborde en arrière d'une longueur égale à celle du dernier segment dorsal."

"Dessous de l'abdomen de couleur un peu plus pâle que le dessus; de même consistance."

"Le bord posterieur de chaque segment du thorax et de l'abdomen, en dessus et en dessous, est hérissé de poils horizontaux, courts, fins, peu serrés et pâles."

"Tout le corps de l'insecte, en dessus et en dessous, est moiré et reconvert d'un duvet couché, fauve-doré, et visible seulement à l'aide d'une forte loupe."

NOTE ON THE *GONOLABIDÆ*.

Verhoeff's family *Gonolabidæ* is characterized by the form of the prosternum, which is strongly narrowed posteriorly, so that the first pair of legs have their insertion very close together. In *G. peringueyi*, Borm., the anterior coxæ are almost contiguous, but in the type of *G. kirbyi*, Burr, this narrowing is far less marked, though in this species the characteristic apical dilation of the abdomen is very pronounced. A *G. javana*, Borm., ♀ in my possession has also the normal parallel prosternum, but a ♀ of *G. silvestrii*, Borelli, has this plate much more

narrowed. *G. inca*, Burr, has the insertion of the anterior coxæ by no means contiguous, though the prosternum is somewhat narrowed.

This narrowing of the prosternum appears to accompany the apically dilated abdomen, for we find it in *Chelidura aptera*, Charp., *Ch. dilatata*, Lafr., although not so pronounced, and the coxæ are far from contiguous.

In the remarkable genus and species, *Gonolabina kuhlgatzi*, Verh., this narrowing is very marked, but yet the abdomen is not strongly dilated; it is broadest in the middle, though not very noticeably so.

In characterizing the *Gonolabidæ*, Verhoeff says, "Pygidium mit der 10. Dorsalplatte des Abdomens völlig verwachsen" (in which character they approach the *Apachyidæ*).

In *Gonolabis* itself there is no pygidium; Verhoeff's characterization is not clearly expressed, for he mentions the form of the pygidium in his characterization of the family, though in the typical genus *Gonolabis*, in his own words, the pygidium is "steil abfallend"; he is also incorrect in saying, "Zange des ♂ symmetrisch"; in *G. kirbyi*, Burr, the forceps are asymmetrical, as in *Anisolabis maritima*.

Gonolabina is a very curious genus, though Verhoeff fails to separate it readily from *Gonolabis*. It is in fact very distinct. The last segment of the abdomen of the ♂ is very curious in form, being strongly depressed between the forceps, forming an edge at the conjunction of the dorsal and ventral plates, and this part is strongly pubescent; the edge itself is furnished with two small tubercles, which apparently represent the pygidium. In the ♀ the pygidium takes the form of a blunt cone, and only in this sex is there a faint transverse line which indicates the point of fusion of the pygidium with the segment.

Verhoeff makes no references to the antennæ; except that they have 19 segments; the 1st segment is very large, the 2nd extremely small; the 3rd nearly as long as the 1st, the 4th hardly longer than the 2nd, the 5th a shade longer, the 6th slightly longer than broad, and onwards they gradually increase in length; I count 20 segments.

The head is black, and the mouth parts brown; the antennæ dark-brown, and the eyes prominent and white.

The body itself is bald, except the last abdominal segment of the male, which is covered with thick yellowish pubescence. The tibiæ and tarsi are pubescent and the femora have a few bristles; the second tarsal segment is not quite cylindrical, but slightly broadened and flattened, which may perhaps indicate a transition towards *Chelidura*.

Spongiphora geayi, sp. n.

Fusco-testacea. Caput supra margine postico pone oculos utrinque impresso-signatum: antennæ segmento 1 maximo, 2 minimo, 3 longiori, 4 breviori, dehinc sensim longioribus (segmenta 8 restant). Pronotum quadratum, antice rectangulum, postice rotundatum, prozona tumido-elevata, metazona deplanata, sulculo medio ante marginem posticum obsoleta instructa. Elytra ampla, fusco-testacea, macula humerali magna flava ornata; alæ amplæ, medio flavo-maculatæ. Metasternum punctis impressis duobus instructum, margine postico truncato. Mesosternum æque longum ac latum. Segmentum ultimum dorsale magnum, oblongum, læve, inerme. Lamina subgenitalis ♂ valde productum, prope basin lateribus parallelis, deinde sensim convergentibus, prope apicem iterum parallelis vel paullo divergentibus, apice ipso triangulari. Segmentum penultimum ventrale magnum, rotundatum, quadratum, margine postico medio paullo rotundato-excisum; segmentum ultimum parvum, extus penultimum, a latere visum, latum, brevissimum. Pygidium breve, transversum, tumidum, marginibus in laminam angustam circumcurrentem deplanatis, apice truncato, angulis lateralibus acutis. Forcipis bracchia valida, parallela, recta, margine interno usque ad apicem denticulata, margine interno ad tertiam partem longitudinis dente parvo acuto armata; apice tantum attenuata, acuta, haud vel vix incurva. ♂.

Long. corporis . . . 11 mm.
„ forcipis . . . 2·8 „

Hab. Darien. (*F. Geay*, 33–96, 1 ♂, Mus. Paris.)

A very distinct species, characterized by the form of the subgenital lamina and of the pygidium and forceps.

Spongiphora assiniensis, Borm.

De Bormans only knew the female of this species, of which I think I have found the male, from Fernando Po, in the Paris collection. The following are the characters of the male:—

Abdomen latum; segmentis 2 et 3 tuberculis lateralibus instructis; segmentum ultimum dorsale magnum, latum, lævе, supra insertionem forcipis utrinque tuberculo obtuso instructum; pygidium breve, latum, transversum, margine postico in tubercula valida acuta producto; forcipis bracchia basi remota, sat valida, depressa, lævia, brevia, incurva, margine interno medio dentibus parvis acutis duobus armata, apice attingentia. ♂.

	♂
Long. corporis . . .	7 mm.
„ forcipis . . .	1·5 „

Hab. West Africa, Assini (*de Bormans*); Fernando Po (*L. Conradt*, 1901. 2♂, 3♀. Mus. Paris).

In the short forceps, this species approaches *S. parvicollis* and *S. similis*, but differs in the larger and broader pronotum; the form of the pygidium and forceps distinguish it easily from its other congeners.

Labia ochropus, Stål.

The Paris collection contains a *Labia* from Mayotte (Alluaud, 4–96), which I refer to this species; the specimen is so small, the wings cover the somewhat telescoped abdomen so completely, and the specimen is gummed to a card, that it is impossible to distinguish the sex, but from the shortness of the abdomen I imagine it to be a female. De Bormans (Tierreich, Forf., 1900, p. 70) credits the species with 11 segments to the antennæ, but this specimen has at least 13; the first is long and big, and the second, which is exceedingly small, is black; the third is a little longer, but the fourth is smaller than the third, and the remainder gradually increase in length towards the apex; segments 3–9 are yellowish, and the four apical segments black; the head is dull black, the pronotum is rather large, square, dark-brown like the elytra; the wing scales are yellow, with a narrow brownish spot on the suture; the feet and forceps are yellow and the abdomen black; the tibiæ have a small narrow dark-brown band; the pygidium is small, transverse, with two little sharp points; the branches of the forceps are remote at the base, simple, unarmed, regularly incurved, the points not crossed.

Stål records the species from Caffraria, and M. Henri Gadeau de Kerville possesses a female from German East Africa. It is probably widely distributed.

Labia alluaudi, sp. n.

L. mucronatæ, Stål, vicina. Statura majori ; colore fusco-brunneo, nitenti, pallido-vittato vel -annulato ; caput nigrum ; antennæ 12-segmentatæ, segmentis 4 basalibus testaceis, 5–8 nigris, 9–10 albis, 11–12 nigris ; pronotum quadratum, margine postico quam margine antico paullo latius, angulis rotundatis, medio nigrum, utrinque late pallido-vittatum. Elytra longa, apice recte truncata, nigra, media late pallido-vittata ; alæ valde prominentes, fuscæ, externe late pallido-marginatæ ; femora nigra, apice pallido-annulata ; tibiæ tarsique testacei ; abdomen nigrum, fulvo-nitens, plicis lateralibus distinctis : pygidium, ♂ prominens, oblongo-quadratum, margine postico profunde exciso, ♀ haud perspicua : forcipis bracchia fusco-brunnea, basi pallido-annulata ; ♂ basi remota, valida, recta, triquetra, prope basin margine interno dente parvo aramata, dehinc inermia, sensim convergentia; ♀ recta, contigua, inermia ; segmentum ultimum dorsale ♂ magnum, prope marginem posticum medio impressum, haud tuberculatum. ♂ ♀.

	♂	♀
Long. corporis . . .	8 mm.	7–8·5 mm.
„ forcipis . . .	3·5 „	1·5–2 „

Hab. Madagascar, "Région du sud-est, Fort Dauphin, 3 ♂♂, janvier 1901," 3 ♂♂ (*Ch. Alluaud*, Mus. Paris) ; Nossi-bé, 1 ♂ (*H. Pierron*, 1885, Mus. Paris) ; Diego, Suarez, 1 ♂, 4 ♀♀ (*Ch. Alluaud*, iv–96, Mus. Paris).

Allied to *L. mucronata*, but differs in the form of the pygidium and forceps of the male.

I am very pleased to dedicate it to that indefatigable collector, M. Charles Alluaud.

Labia triangulata, sp. n.

L. pygidiatæ vicina. Statura magna, colore rufo-brunneo, capite pronoto elytris fuscioribus ; corpus totum pilis raris longis instructum. Caput nigrum, vel nigro-fuscum ; antennæ 12-segmentatæ, 1 maximo, 2 minimo, 3 elongato, ceteris longis, validis, fuscæ, segmentis 5 apicalibus pallidioribus. Pronotum fusco-testaceum, quadratum, postice quam antice vix angustius, angulis rotundatis, in parte anteriori paullo tumidum, postice deplanatum, sulculo medio impresso. Elytra brevia, nigro-testacea, minute punctulata. Alæ abbreviatæ, haud perspicuæ. Pedes toti testacei. Abdomen longum, cylindricum, fulvo-rufum, postice leviter infuscatum ; segmentum ultimum dorsale ♂ ♀ læve, margine postico medio leviter impresso, haud tuberculato. Pygidium, ♂ prominens, dilatatum, transversum,

utrinque atque apice in dentem productum, dente apicali obtusangulo, lateribusque acutis; ♀ haud perspicuum. Forcipis bracchia ♂ basi remota, valida, recta, margine interno medio dente forti armata, elongata, apicem versus acuminata, leviter incurva; ♀ basi subcontigua, validiora, inermia, recta, conica. ♂ ♀.

	♂	♀
Long. corporis . . .	7–7·5 mm.	6·25 mm.
„ forcipis . . .	1·75–2 „	1·25 „

Hab. Diego Suarez (*Alluaud*, 4–96, Mus. Paris).

This species is allied to *L. ridens* and *L. pygidiata*, but differs in the distribution of colours, absence of wings, by the shape of the pygidium, which has the form of a transverse plate, produced posteriorly into a blunt point, while the lateral edges are angular, so that the organ assumes the shape of the 3-pointed lobe, whereas *L. pygidiata* has 4 points. In the larva the pygidium is straight, conical and pointed.

Labia insularis, sp. n.

L. amœnæ vicina. Colore fusco, pallido-variegato. Caput nigrum; antennæ 13-segmentatæ, segmentis 1–5, 10, 11 pallidæ, 6–9, 12, 13 nigræ. Pronotum nigrum, lateribus anguste fulvo-marginatis. Elytra magna, nigra, vitta magna lata flava media ornata. Alæ (sæpe abbreviatæ) flavæ, macula fusca ornatæ. Femora fusca, genubus pallidis; tibiæ pallidæ, medio fusco-annulatæ; tarsi toti pallidi. Abdomen nigrum, vel rufo-nigrum, plicis lateralibus distinctis; segmentum dorsale angustum, supra insertionem forcipis utrinque tuberculatum. Pygidium ægre distinguendum, ♂ breve, conicum. Forcipis bracchia: ♂ basi remota, rufa vel flava, margine interno prope basin dente parvo acuto armata, subrecta, sensim incurva, apice attingentia; ♀ sæpe colore fusciori, rufo, subcontigua, breviora, valida, conica, apice decussata. ♂ ♀.

	♂	♀
Long. corporis . . .	5–7·25 mm.	6·75–7 mm.
„ forcipis . . .	1–1·2 „	1–1·25 „

Hab. Madagascar, "Région du sud-est, pays Androy, Imanombo," ix, 1901 (*Ch. Alluaud*, Mus. Paris); Diego Suarez (*Ch. Alluaud*, iv–96, Mus. Paris).

Allied to *L. amœna*, Stål, but differs in colour, and the shape of the pygidium and forceps; very variable in colour, but the females appears to be, as a rule, darker than the males. Of the two forms, the males are most numerous of the wingless, and the females of the winged forms. The

specimens from Imanombo are four winged males, and three larvæ; from Diego Suarez, one winged male and six females, and of the wingless form, eight males and one female.

Labia forceps, sp. n.

Caput convexum, pone oculos per suturam in duas regiones tumido-elevatas divisum: antennæ 12 segmentis, fusco-testaceæ, segmentis 2 apicalibus albis: pronotum magnum, quadratum: elytra brevia, fusco-testacea, ad humeros pallidiora, minutissime punctulata: alæ longæ, minutissime punctulatæ, fusco-testacea: pedes fusco-testacei: abdomen latum, rufo-testaceum, tuberculis lateralibus indistinctis: segmentum ultimum dorsale transversum, læve: pygidium rectum, lateribus parallelis, apice truncatum et medio tuberculo parvo instructum; forcipis bracchia basi remota, valida, depressa, recta, parallela, margine interno prope apicem dente acuto et forti armata, cum apicibus valde incurvis aream circularem includenti. ♂.

	♂
Long. corporis . . .	5·5 mm.
„ forcipis . . .	2 „

Hab. MADAGASCAR, "Région du sud-est, Vallée d'Ambolo, Col de Sakavalana, 1 ♂, Jan. 1901" (*Ch. Alluaud*, Mus. Paris).

Nearest perhaps to *L. ridens*, Borm., but characterized by the form of the forceps.

Labia paradoxa, sp. n.

Fusco-castanea, lævis, valde nitens; corpus pilosum; caput fusco-rufum, supra nigrescens, oculis parvis, nigris; (antennæ . . . ?); pronotum quam caput æque latum, breve, transversum, lateribus rectis, angulis ipsis rotundatis, fusco-castaneum, angulis anticis pallescentibus. Elytra lata, fusco-castanea, apice fulvescentia: alæ prominentes, fusco-castaneæ: pedes breves, validi, testacei: abdomen basi angustum, dehinc dilatatum, paullo ante apicem latitudo maxima; segmentis 2 and 3 tuberculis lateralibus parvis instructis; segmentum ultimum dorsale magnum, breve, transversum, medio impressum, margine postico declivi, supra insertionem forcipis paullo tuberculatum; segmentum penultimum ventrale magnum, rotundatum, segmentum ultimum totum obtegens: pygidium transversum, breve, bituberculatum: forcipis bracchia ♂ basi remota, basi ipso margine interno supra spina acuta armata, paullo incurva, ac deorsum decurva, subtus prope basin in parte angulata paullo excavata; subtus in medio longitudinis dente forti intus ac deorsum spectanti armata, tum horizontalia, incurva, inermia, apice attingentia. ♂.

	♂
Long. corporis . . .	7·3 mm.
„ forcipis . . .	1·8 „

Hab. Ecuador, Mirador, Santa Inez, 4101 ft., 3, iv. 1 ♂. (Type in my collection.)

This is an aberrant form, which I have ranged in *Labia* on account of its cylindrical second tarsal segment; the form of the forceps is curious, and rather recalls that of some *Anechura* or *Chelidura*.

Platylabia gestroi, Bormans.

The Paris collection contains a female from Diego Suarez (Alluaud, 4–96), that I consider to be of this species; it is recorded from Fly River, New Guinea, and only the male has been described, the so-called female of Dubrony (Ann. Mus. Civ. Gen., xiv, 1879, p. 372) being the nymph.

If this is the true female, it hardly differs from the male; the pygidium has the same shape, but the branches of the forceps are simpler, not being dilated nor depressed on the inner margin. The colour is very dark, but the members of this genus and the allied genera *Sparatta* and *Chætospania* often darken after death.

REVISION OF THE GENUS *CHÆTOSPANIA*, KARSCH.

TABLE OF SPECIES.

1. Pygidium ♂ haud perspicuum. (Statura minore; alæ abbreviatæ; species borneensis)	1. *parvula*, Burr.
1.1. Pygidium ♂ prominens.	
2. Pygidium ♂ 4-tuberculatum vel 4-spinosum.	
3. Pygidium ♂ 4-tuberculatum; caput, elytra, alæ, abdomen nigra; pronotum, pedes, segmentum dorsale, forceps fulva.	2. *semifulva*, Borm.
3.3. Pygidium ♂ in stellam 4-spinosam productum. Corpus unicolor fusco-testaceum	3. *stella*, Burr.
2.2. Pygidium ♂ nec tuberculatum nec spinosum.	

3. Antennæ unicolores. Forceps ♂ margine interno dentibus 3 parvis armatus. (Pygidium ♂ ♀ parvum, quadratum, apice truncatum ; corpus unicolor fusco-testaceum) . . . 4. *juppiter*, Burr.

3.3. Antennæ segmentis nonnullis pallidis. Forceps ♂ margine interno unidentatus.

4. Pygidium ♂ conicum, acutum ; ♀ quadratum, postice leviter emarginatum. (Unicolor nigra, tarsis pallidis) . . . 5. *volcana*, sp. n.

4.4. Pygidium ♂ oblongum vel quadratum. Color partim niger, partim rufo-testaceus.

5. Pygidium ♂ oblongum, apice excisum. Species orientalis . . . . . 6. *feæ*, Borm.

5.5. Pygidium ♂ parvum, quadratum, integrum. Species madagassæ . . . . . 7. *inornata*, Karsch.

Chætospania volcana, sp. n.

Atra, segmentis ultimis antennarum tarsisque pallidis. Antennæ 11-segmentatæ, atræ, segmentis 2 ultimis pallidis ; Pronotum quadratum, postice truncatum, antice subangustatum, capite haud angustius. Elytra minutissime punctulata, atra, postice oblique truncata ; alæ atræ, valde prominentes. Pedes atri, tarsis pallidis. Abdomen minutissime punctulatum, atrum, lateribus sparsim pilosis ; segmentum ultimum dorsale atrum, simplex, quadratum, medio subimpressum. Pygidium : ♂ parvum, conicum, acutum ; ♀ quadratum, prominulum, margine postico leviter emarginatum. Forcipis bracchia ♂ ♀ basi distantia, valida, subrecta, depressa, apice incurva, nigra vel nigro-rufa, margina interno medio utroque sexu laminato-depresso, in ♂ in dentem validum producto. ♂ ♀.

	♂	♀
Long. corporis . . .	7·5 mm.	9 mm.
,, forcipis . . .	3 ,,	2·5 ,,

Hab. Diego Suarez, iv, '96 (*Alluaud*, 13 ♂♂, 12 ♀♀, Mus. Paris).

Easy to distinguish by its plain black colour and the

form of the pygidium and forceps. It is the only species yet known in which the pygidium is shaped like a blunt cone.

Sparatta W-signata, sp. n.

Caput, pronotum, elytra, alæ atra; abdomen, pedes, forceps rufa; antennæ? 15-segmentatæ; pronotum antice angustatum, prozona elevata, metazona deplanata, sulculo medio instructum, utrinque indistincte impressum: elytra atque alæ aterrima, nitida. Pedes rufi, femoribus incrassatis, tibiisque gracillimis. Abdomen rufum nitidum, basi paullo constrictum; segmentum ultimum dorsale magnum, quadratum, læve, medio sulculo indistincto W-formato impressum, marginibus sulculis in carinulas indistinctas elevatis. Pygidium vix perspicuum, transverso-ovale. Forcipis bracchia basi remota, paullo incrassata et divergentia, triquetra, margine inferiori interno crenulato, tum gracilia, parallela, medio dente acuto armata, deinde margine interno deplanato ac dilatato, in dentem acutum producto, in tertia parte apicali inermia, incurva, apice acuta, attingentia vel decussata. ♂.

	♂
Long. corporis . . .	9·25–10·5 mm.
„ forcipis . . .	3·5–4 „

Hab. Mexico (*Lucas*), 2 ♂♂ (Mus. Paris); one has the left branch of the forceps simple and only partially developed.

Mecomera weissi, sp. n.

Caput, elytra, alæ atra: corpus, forceps, pedes rufa: antennæ 15 segmentis; segmento 3 brevissimo, 4 and 5 brevibus, ceteris elongatus; segmentis 1–6, 13, 14 rufis, 7–12, 15 nigris: pronotum paullo longius quam latius, margine antico convexo, postico rotundato: elytra ampla, lata; alæ prominentes: pedes unicolores: tarsi segmento primo brevi: abdomen rufum, lateribus nigro-variegatis, segmentis 2 and 3 tuberculo laterali distincto instructis: segmentum ultimum dorsale magnum, quadratum, margine postico medio trisulculato, angulis exterioribus acutis: pygidium breve, transversum, quadratum: forcipis bracchia basi remota, depressa, elongata, subrecta, sensim incurva, denticulis 2 parvis armatis. ♂.

	♂
Long. corporis . . .	11·6 mm.
„ forcipis . . .	3·7 „

Hab. Tonkin, Central, "environs de Tuyen-Quan, vii–ix," 1 ♂ (*A. Weiss*, 1901, Mus. Paris).

This species is quite different from the American *M. brunnea*, Serv., and from the Sumatran *M. modiglianii*, Borm.; in appearance it rather resembles a *Sparatta*, but is distinguished by the generic characters.

REVISION OF THE GENUS *OPISTHOCOSMIA*, DOHRN.

A number of new forms have been described since the publication of de Bormans' monograph, and so I have drawn up a new table of the species.

The species are as variable as in most genera of the Dermatoptera; it is common to find, in a series of one species from the same locality, specimens with spotted elytra and others with unspotted elytra; these varieties, which do not deserve the rank of sub-species, or a separate name, I have placed twice in the table.

I cannot admit Verhoeff's genus *Cosmiella*, which is only based upon the absence of wings, a notoriously unstable and valueless character; at the best, it can only be accepted as a sub-genus.

TABLE OF SPECIES.

1. Alæ abbreviatæ (*Cosmiella*, Verh.)
   2. Forceps ♂ supra dente magno armatus . . . . . 1. *rebus*, Burr.
   2.2. Forceps supra dente nullo.
      3. Segmentum ultimum dorsale ♂ ♀ haud vel vix impressum nec tuberculatum; forcipis bracchia ♂ basi contigua . . . . . 2. *neolobophoroides*, Burr.
      3.3. Segmentum ultimum dorsale ♂ distincte impressum et subtuberculatum; forcipis ♂ bracchia basi haud contigua, paullo remota.
         4. Colore nigro.
            5. Pronotum abdomenque nitentia . . . . . 3. *dubia*, Borm.
            5.5. Pronotum abdomenque haud nitentia . . . . 4. *aptera*, Verhoeff.
         4.4. Colore brunneo, fusco-variegato, cupite rubro. (Forceps ♂ inermis) . . . . . 5. *micheli*, sp. n.

1.1. Alæ perfecte explicatæ.
2. Statura minore (6-7 mm.) . . . 6. *minuscula*, Borm.
2.2. Statura majore (10 mm. vel magis)
3. Forcipis bracchia ♂ basi contigua.
4. Elytra maculata vel vittata.
5. Elytra vittata.
6. Elytra fusco-brunnea, medio anguste rufo-vittata; species madagassa 7. *hova*, Borm.
6.6. Elytra rufa, margine interiori nigro-vittata; species orientalis . . 8. *armata*, Haan.
5.5. Elytra maculata.
6. Elytrorum macula magna, ovalis; alæ rufo-flavæ, apice nigro-maculatæ . . . . . 9. *humeralis*, Kirb.
6.6. Elytrorum macula minima; alæ apice pallido-punctatæ.
7. Antennæ unicolores; forcipis bracchia ♂ basi divergentia, dente superno basali armata 10. *beccarii*, Borm.
7.7. Antennæ pallido-annulatæ; forcipis bracchia ♂ basi parallela, contigua, dente superno armata . . . 11. *forcipata*, Haan.
4.4. Elytra unicoloria.
5. Color niger.
6. Forcipis bracchia ♂ per primam dimidiam longitudinis recta, parallela, subcontigua . . . . 12. *erroris*, sp. n.
6.6. Forcipis bracchia ♂ basi leviter divergentia, haud parallela.
7. Forceps ♂ inermis . 13. *burri*, Borm.
7.7. Forceps ♂ dentatus.
8. Forcipis bracchia ♂ dente uno medio forti armata . . . 14. *vicina*, sp. n.

8.8. Forcipis bracchia ♂ dentibus duobus armata.
9. Antennæ pallido-annulatæ; segmentum ultimum dorsale haud carinatum . . . . 15. *lugens*, Borm.
9.9. Antennæ unicolores. Segmentum ultimum dorsale supra carinatum. 16. *nevilli*, sp. n.
5.5. Color brunneus.
6. Antennæ unicolores.
7. Forcipis bracchia ♂ basi ipso parallela, intus dentibus 2 armata; statura minore, gracili . . . . . 17. *ceylonica*, Motsch.
7.7. Forcipis bracchia ♂ basi ipso divergentia, dente interno uno minimo vel nullo; statura majore, robustiori . . . . . 18. *insignis*, Haan.
6.6. Antennæ annulatæ.
7. Abdomen lateribus tuberculatis.
8. Abdominis segmenta 6 and 7 in dentes obtusos, 8 in dentem acutum producta . 19. *dux*, Borm.
8.8. Abdominis segmenta 6–8 in tubercula obtusa producta; (forc. bracchia ♂ supra dente forti obtuso armata) . . 18. *insignis*, Haan.
7.7. Abdomen lateribus inermibus.
8. Forceps margine interno ♂ inermis, bracchiis subparallelis . . . . . 20. *tenella*, Haan.

8.8. Forcipis bracchia ♂ margine interno dente uno acuto armata, apicem versus aream ovalem includentia . . . 21. *forcipata*, Haan.

3.3. Forcipis bracchia ♂ basi remota, haud contigua.

4. Elytra maculata vel vittata.

5. Elytra brunnea, flavo-maculata . . . . . 22. *centurio*, Haan.

5.5. Elytra nigra, indistincte extus fusco-rufo-vittata . 23. *oannes*, Burr.

4.4. Elytra unicoloria.

5. Forcipis bracchia ♂ tum divergentia, tum convergentia, tum sursum, tum deorsum curvata.

6. Forcipis bracchia ♂ deorsum ac sursum curvata, dentibus fortibus armata.

7. Abdominis segmenta lateribus 2–5 tuberculatia . . . . . 24. *cervipyga*, Kirb.

7.7. Abdominis lateribus segmentis 2 and 3 tuberculatis. . . . 25. *longipes*, Haan.

6.6. Forcipis bracchia ♂ horizontalia, primum divergentia, deinde convergentia.

7. Colore metallico, atro, nitido; elytra alæque atra . . . . . 26. *biroi*, Burr.

7.7. Colore haud nitido, brunneo; alis maculatis . . . . . 27. *simplex*, Borm.

5.5. Forcipis bracchia ♂ subparallela, vel subsinuata.

6. Forcipis bracchia ♂ dente unico armata.

7. Forcipis dente horizontali margine in-

terno, acuto. (Antennæ apice pallido-annulatæ) . . . . 28. *brahma*, sp. n.

7.7. Forcipis dente verticali.

8. Species orientales.

9. Color fuscus, alis flavis, capite rubro . . . . 29. *annandalei*, sp. n.

9.9. Color niger. . . 30. *shelfordi*, sp. n.

8.8. Species americana; color unicolor, brunneus . . . . . 31. *americana*, Borm.

6.6. Forcipis bracchia ♂ dentibus duobus armata.

7. Species americana. Forcipis bracchia ♂ aream basalem includentia, apicem versus contigua . . . . . 31. *amazonensis*, Borm.

7.7. Species orientales. Forcipis bracchia ♂ apice non contigua.

8. Forcipis bracchia ♀ gracilia, dente primo acuto . . . . . 30. *temora*, sp. n.

8.8. Forcipis bracchia ♂ robustiora, dente primo obtuso, verticali.

9. Forcipis dente secundo ante medium, sito, margine interno denticulato . . 31. *komarowi*, Sem.

9.9. Forcipis dente secundo paullo ante apicem sito, margine interno integro . . . . 21. *oannes*, Burr.

Opisthocosmia micheli, sp. n.

Statura minori; caput rubrum; antennæ . . . ? (restant segmenta unicoloria fusca 10); pronotum latum; capite vix angustius,

quadratum, fuscum, lateribus pallidioribus. Elytra fulvo-fusca, indistincte utrinque nigro-marginata, brevia, apice truncata; alæ abbreviatæ; pedes unicolores, fusco-testacei, graciles; abdomen nigrum, sensim dilatatum, sed apice angustatum, segmentis lateralibus, ♂ 2–4, ♀ 3–4 tuberculis pliciformibus instructis, quorum posticum maximum; abdomen nigrum, haud nitens; segmentum ultimum dorsale ♂ parvum, angustatum, haud tuberculatum, medio impressum, ♀ declive, angustius, medio profunde triangulariter impressum; segmentum ultimum ventrale ♂ angustum, transversum, ♀ ovale; pygidium ♂ haud perspicuum, ♀ minimum, conicum: forcipis bracchia, ♂ basi subcontigua, valida, inermia, subrecta, apice flexuoso-incurva, decussata; ♀ brevia, simplicia, recta. ♂ ♀.

	♂	♀
Long. corporis . . .	7·5 mm.	10 mm.
„ forcipis . . .	2·5 „	2·25 „

Hab. Abyssinia, 1 ♂, 1 ♀ (Mission de Bonchamps, *Ch. Michel* and *M. Potter*, Mus. Paris).

Allied to *O. hora*, Borm., but differs in its stouter build and darker colour. From *O. aptera*, which I only know from Verhoeff's description, it differs in its paler colour, reddish head, and unarmed forceps.

Opisthocosmia erroris, sp. n.

Statura majore. Niger. Antennæ (?) 13 segmentatæ, apicem versus pallido-annulatæ. Pronotum capite angustius, medio nigrum, paullo elevatum, marginibus lateralibus rufescentibus, reflexis, margine antico recto, postico rotundato. Elytra haud nitida, atra, lata; alæ nigræ, basi atque apice rufo-punctatæ. Pedes graciles, longi, rufo-nigri. Abdomen nigrum, vix dilatatum, segmentis lateralibus 3–4 ♂, 4 ♀ (ut videtur) tuberculis instructum; segmentum ultimum dorsale declive, angustum, margine postico recto, ♂ supra insertionem forcipis utrinque tuberculo obtuso instructum; ♀ declive, angustius, vix tuberculatum; segmentum penultimum ventrale rotundatum. Forcipis bracchia; ♂ nigra, rufescentia, basi contigua, parallela, inermia, rectissima usque secundam tertiam partem longitudinis; tum dente acuto forti superno armata, subito ovale-curvata, aream ovalem includentia; apice paullo incrassata, dente margine interno valida armata, tum iterum recta, contigua, attenuata, apice ipso mucronibus decussatis; ♀ recta, gracilia, simplicia. ♂ ♀.

	♂	♀
Long. corporis . . .	11·5 mm.	11–14 mm.
,, forcipis . . .	7·75 ,,	5·25–6·5 ,,

Hab. Sarawak, Penrissen, v, 1899 (*Shelford*, type in my collection); Malacca Peninsula (*Errington de la Croix* and *P. Chapé*, 1899; Mus. Paris).

Opisthocosmia lugens, Burr, 1900. Ann. Mag. N. H. (7), vi, p. 101 (nec de Bormans).

I first confused this species with *O. lugens*, Borm., but have since been able to examine the type of the latter; it is a distinct species, characterized chiefly by the form of the ♂ forceps. The Paris specimen has unfortunately lost the forceps, but the rest of the body agrees with *O. erroris*.

Opisthocosmia vicina, sp. n.

Tota nigra, nitida; *O. lugenti* vicina; ab ea differt elytra nitidioribus, abdomine nitido sed haud ænæo-nitenti; forcipis bracchiis ♂ dente unico, minus forti, armatis. ♂ ♀.

	♂	♀
Long. corporis . . .	9 mm.	9·5 mm.
,, forcipis . . .	4 ,,	5 ,,

Hab. Sarawak, Matang, iv, vi, 1900. 1 ♂, 3 ♀♀; Penrissen, iv, 1899. 1 ♀ (*Shelford*).

Closely allied to *O. lugens*, Borm., but differs in the points indicated in the description.

Opisthocosmia nevilli, sp. n.

Statura majore; nigerrima, nitidissima (♀ variat colore rufo-nigro, minus nitido); corpus gracile, elongatum, glabrum. Antennæ 12-segmentatæ, nigræ vel brunneæ. Caput tumidum, nigrum, æneo-nitens, oculis parvis atris. Pronotum atrum, æneo-nitens, læve, antice tumidum, postice deplanatum, margine antico subrecto, postico deplanato. Elytra rufo-nigra, lævia, haud nitida, postice truncata; alæ atræ, læves, nitidæ, apice suturæ pallido-punctatæ. Pedes rufo-nigræ, geniculis fuscioribus. Abdomen nigerrimum (♀ nigro-rufum), læte æneo-nitens, minute punctulatum, elongatum, medio dilatatum, apicem versus attenuatum; plicis lateralibus valde distinctis; segmenta 4–6 etiam lateribus tuberculis pliciformibus instructa. Segmentum ultimum dorsale ♂ transversum, utrinque carinis 2, ab apice basin versus oblique ductis, instructum, valde declive, medio inter carinas lateralibus superioribus profunde

impressum; margine postico subrotundato, medio bituberculato, angulis externis acutis; ♀ valde declive, attenuatum, margine postico subbituberculato, simplex. Pygidium haud perspicuum, ab infero visum, parvum, obtusum ♂ ♀. Forcipis bracchia: ♂ longissima, gracilia, basi subcontigua, usque ad tertiam partem apicalem sensim divergentia, deinde ovato-incurva, apicibus decussatis, margine interno basi ipso crenulato; tertia parte basali margine interno supra dente forte laminato sursum spectanti armata, tertia parte apicali margine interno dente valido acuto armata; ♀ basi subcontigua, subrecta, paullo divergentia, apicem versus incurva, apicibus decussatis, margine intero plus minus crenulata. ♂ ♀.

	♂	♀
Long. corporis . . .	11·5–15·5 mm.	10–12·5 mm.
„ forcipis . . .	8·5–11·5 „	6·7 „

Hab. India (Dohrn Coll.). India, Bhoutan, Maria-Basti (*Mgr. Durell, R. Oberthur*, 1898. 3 ♂♂, 5 ♀♀. Mus. Paris).

This fine species was described in manuscript some years ago by de Bormans; his type was a male, then unique, in the Dohrn Collection, of which the feet and antennæ were missing.

It is a very distinct species, chiefly remarkable from the colour and form of the forceps; in colour and general appearance it resembles superficially *Anechura metallica*, Dohrn, and, in fact, the females of the two species might be confused, but in the latter the elytra are finely granulated, while they are smooth in *O. nevilli*.

The female is lighter in colour than the male, and smaller; the colour tends rather to dark-reddish. De Bormans' specimens were somewhat larger than those in the Paris collection. In his notes he gives the following dimensions: length of body, 14 mm.; of the forceps, 13·75 mm.

Opisthocosmia brahma, sp. n.

Gracilis; brunnea, capite pedibusque pallidis. Antennæ 12-segmentatæ, fuscæ, segmentis 10 and 11 albis; caput rufo-testaceum, oculis nigris. Pronotum quadratum, capite haud angustius, margine antico recto, postico subrotundato, colore nigrum, lateribus pallido-marginatum. Elytra unicoloria fusco-brunnea; alæ valde prominentes, fusco-brunneæ, apice suturæ pallido-maculatæ. Pedes testacei. Abdomen gracile, apicem versus attenuatum, nigro-

brunneum, nitidum, tuberculis lateralibus valde distinctis ; segmentis 8 and 9 attenuatis ; segmentum ultimum dorsale attenuatum, margine postico subrecto, supra insertionem forcipis obtuse bituberculato, angulis externis acuto-productis. Pygidium haud perspicuum. Forcipis bracchia basi remota, nigra, subrecta, gracilia, elongata, horizontalia, nec sursum nec deorsum curvata, apicem versus incurva, apicibus ipsis valde decussatis, margine interno medio paullo deplanata et dilatata, dente forte acuto armata. ♂. ♀ ignota.

	♂
Long. corporis . . .	11–12 m.m.
„ forcipis . . .	5·5–6 „

Hab. INDIA BOREALIS, Dardjiling (*Harmand*, 2854–90), and Bhoutan, Maria-Basti (Coll. Mgr. Durell, *R. Oberthur*, 1898. 2 ♂♂. Mus. Paris).

This is not closely allied to any known species ; it falls nearest, perhaps, to *O. nevilli*, Borm. Its distinguishing points are the coloration, the horizontal forceps, with no upper teeth, and only one tooth on the inner margin.

Opisthocosmia annandalei, sp. n.

Statura majore. Caput rubrum ; antennæ 11-segmentatæ, fuscæ, segmente 9 albido ; pronotum quadratum, postice rotundatum, nitidum, nigro-badium, marginibus luteis ; elytra badia, apice emarginata ; alæ prominentes, citrinæ, margine interno atro-marginatæ, apice macula atra ornata ; pedes citrini, genubus atris ; abdomen cylindricum, punctulatum, badium, inerme ; segmentum ultimum dorsale angustum, quadratum, margine postico utrinque tuberculatum ; pygidium breve, bilobum, lobis obtusis ; forcipis bracchia ♂ gracilia, basi remota subsinuata, nigra, mucronibus valde decussatis, medio supra dente valido conico armata. ♂. ♀ ignota.

	♂
Long. corporis . . .	13 mm.
„ forcipis . . .	7·75 „

Head clear reddish-brown, shining, sutures indistinct, eyes small, black ; antennæ with 11 segments, dark brown, except the 9th which is white. Palpi testaceous, darker at the apex. Pronotum almost as broad as the head, straight on the anterior border, the posterior border rounded ; shining blackish-brown, the margins clear transparent luteous. Elytra considerably broader than the pronotum at the shoulders, smooth, dull brown, short, the posterior margins sinuate. Wings prominent, clear yellow, with the inner

margin bordered with black, and a black spot at the apex. Feet slender, clear yellow, the knees black. Abdomen cylindrical, finely punctulated, lateral tubercles very distinct; on each segment, at the side, there is a smooth non-punctulate patch, resembling obsolete tubercles; colour blackish-brown; last segment slightly narrower than the preceding, square, the hinder border straight, with a small tubercle above the insertion of the forceps on each side; the outer angles distinct. Pygidium small, obtuse, bifid at the extremity. Forceps ♂ with the branches slender, remote at the base, cylindrical, nearly straight, subsinuate, black, the apices strongly incurved and strongly crossing; just before the middle on each branch above there is a strong sharp tooth, pointing upwards and backwards; seen from the side the forceps are subsinuate.

Hab. Siamese Malay Provinces, Nawnchik, Bukit Bear, April 30th, 1899. "From long grass." 1 ♂.

This is a very handsome species, and I am very pleased to dedicate it to my friend, Mr. Annandale.

It is allied possibly to *O. dux*, Borm., but differs in colour and in the form of the forceps. Its very distinct colour distinguishes it at a glance from any known form.

The specimen is carded, and so it is impossible to examine the under-surface.

Opisthocosmia shelfordi, sp. n.

Nigra, nitida; antennæ nigræ, haud annulatæ; pronotum capite æque latum, antice rectum, postice rotundatum, nigrum, lateribus pallido-marginatum; abdomen nitidum, tuberculis lateralibus distinctis; segmentum ultimum dorsale parvum, declive, medio impressum, supra insertionem forcipis utrinque tuberculatum; apud ♀, inerme; pygidium haud perspicuum; forcipis bracchia, ♂ basi remota, gracilia, recta, horizontalia, sensim incurva, medio margine interno supra dente acuto, intus ac sursum spectanti, armata, apice decussata; ♀, inermia, gracilia, incurva. ♂ ♀.

	♂	♀
Long. corporis . . .	7·3–9 mm.	8 mm.
,, forcipis . . .	4·5–7·4 ,,	4·5 ,,

Hab. Sarawak, Kuching, i, iii, v, ix, 1900–3 (*Shelford*). 4 ♂, 1 ♀.

Allied to *O. americana*.

Opisthocosmia temora, sp. n.

Nigra, nitida. Antennæ . . . (5 segmenta restant) fuscæ. Caput fuscum, suturis valde perspicuis. Pronotum capite angustius,

quadratum, margine antico recto, postico subrotundato, angulis rotundatis. Elytra brunnea, unicoloria, postice oblique truncata. Alæ brunneæ, extus indistincte pallido-vittatæ. Pedes testacei, hirsuti. Abdomen nigrum, nitidum, parallelum, apicem versus paullo dilatatum ; segmentum ultimum dorsale abdomine angustius, quadratum, declive, nigrum, nitidum, læve, margine postico recto, supra insertionem forcipis subtuberculato, extus angulato. Pygidium vix perspicuum, parvum, breve, obtusum. Forcipis bracchia valde pubescentia, nigra subrecta, paullo flexuosa, basi remota et paullo divergentia, paullo ante medium sensim convergentia, deinde recta, apicibus incurvis, attingentibus, margine interno dentibus acutis duobus oblique sursum spectantibus, altero paullo ante, altero paullo pone medium, armata. ♂. ♀ ignota.

	♂
Long. corporis . . .	9·7 mm.
„ forcipis . . .	6 „

Hab. INDIA BOREALIS, Dardjiling, 1 ♂ (*Harmand*, 2854–90. Mus. Paris).

Not closely allied to any described species ; it is nearest, perhaps, to *O. lugens*, Borm.

Anechura schlagintweiti, sp. n.

Robusta, glabra, nitida, nigerrima. Antennæ 11-segmentatæ, typicæ, segmento 2 parvo, 3 longiori, 4 quam 3 breviori, dehinc elongatis ; fusco-brunneæ vel nigræ ; caput totum læve, nigrum, nitidum, suturis vix perspicuis. Pronotum totum læve, nigrum, oblongum, latius quam longius, quam caput æque latum, margine antico recto, postico subrotundato, angulis omnibus rotundatis, lateribus reflexis, angulis anticis margine antico in carinas parvas breviter productis. Elytra lævia, nigra, postice truncata ; alæ valde prominentes, læves, nigræ. Pedes nigri, valde compressi, tarsis brunneis, pallido-pubescentibus. Abdomen depressum, latum, tuberculis lateralibus valde distinctis, læve, nigrum ; ♂ valde depressum, apice dilatatum, breve ; ♀ minus depressum, longius, in tertia parte apicali dilatatum ; segmentum ultimum dorsale ♂ abdomine angustius, breve, transversum, nitidum, læve, nigrum, margine postico recto, medio irregulariter tumido, angulis externis supra paullo impresso ; ♀ angustum, simplex, attenuatum. Pygidium vix perspicuum, brevissimum, obtusum. Forcipis bracchia : ♂ robusta, brevia, depressa, basi parum distantia, basi margine interno dente valido et crasso armata, basi depressa et paullo dilatata, deinde divergentia, transverso-ovato valde incurva, apicibus

haud attengentibus, inermia; ♀ simplicia, recta, subcontigua, inermia, apicibus incurvis, attingentibus vel decussatis. ♂ ♀.

	♂	♀
Long. corporis . . .	10–11·5 mm.	12-14 mm.
Lat. pronoti	1·25–2·8 „	„
Lat. max. abdominis .	4·7 „	4 „
Long. forcipis . . .	3 „	3·5 „
Lat. max. forcipis . .	4 „	1 „

Hab. TIBET, Lahol, 1 ♂ (Coll. Dohrn, Borm. in MS., captured by the brothers Schlagintweit). INDIA BOREALIS, Dardjiling, 4 ♂♂, 2 ♀♀. (*Harmand,* 2854–90. Mus. Paris).

This species is described under this name in the manuscript notes of M. de Bormans, from a single male in the Dohrn collection; the Paris collection containing four males and two (hitherto unknown) females, I have redescribed it. It is a very distinct species, most nearly resembling *A. hermes*, Burr, from Sarawak; it is characterized by the uniform black colour, strongly depressed but robust body, the shape of the forceps, which are unarmed, except for the stout but blunt tooth at the base on the inner margin and by the depressed and dilated abdomen of the male, which is very short, and very broad at the apex; the last three or four segments are pushed into each other in a telescopic fashion.

One male is remarkably deformed, only the left branch of the forceps being developed; this is perfect, but the right branch is represented only by a blunt tubercle; it may have been broken off in the larval stage, and not reformed; had this right branch been but slightly more developed, and so been straight and simple, the insect would have had the appearance of a hermaphrodite, and I am strongly of opinion that the so-called cases of hermaphroditism or gynandromorphism occurring not uncommonly in the Forficularia, are due to arrested development of one branch, for, in all examples that I have examined, the abdomen has clearly shown the typical nine segments of the male. It is by no means an uncommon phenomenon in the insects of this order to have the forceps poorly developed, and this may occur from a variety of causes in both, or only in a single branch.

ODONTOPSALIS, nov. gen.

Anechuræ et *Apterygidæ* vicinum genus. Corpus robustum ; antennæ 12-segmentatæ, 1 magno, valido, apice incrassato, 2 minimo, 3 longo, 4 quam tertium vix brevius, ceteris elongatis ; pronotum magnum, transverso-quadratum, capite haud angustius. Elytra alæque perfecte explicata. Pedes validi, segmento secundo tarsorum valde dilatato. Abdomen robustum, plus minus depressum, apud ♂ apicem versus dilatatum, ♀ medio dilatatum, apice attenuatum ; segmentis 2 and 3 tuberculis lateralibus distinctis instructis ; segmentum ultimum dorsale ♂ breve, latum, margine postico tuberculatum ; apud ♀ declive, attenuatum ; segmentum penultimum ventrale transversum, margine postico rotundato, segmentum ultimum obtegens, apud ♀ longius, rotundatum. Pygidium ♂ brevissime, haud productum, valde obtusum, apud ♀ breve, quadratum, apice truncatum, vel conicum. Forcipis bracchia ♂ valida basi remota, triquetra, sensim incurva, apicibus haud attingentibus, prope basin dente valido armata.

Ab	*Anechura*	differt	: pedibus brevibus, robustis ; antennarum segmento 4 longiori.
Ab	*Apterygida*	„	: statura valde robustiori, abdomine dilatato.
A	*Chelidura*	„	: elytris alisque perfecte explicatis.
A	*Forficula*	„	: forcipis bracchiis ♂ nec dilatatis nec deplanatis.

Typus generis : *Odontopsalis harmandi*, Burr, sp. n.

This genus caused me some hesitation. The three males which I have described as *O. harmandi* have the appearance of a winged *Chelidura* ; another form, which I have described under the name *O. lewisi*, scarcely differs from *O. harmandi*, but yet more nearly approaches the typical species of *Apterygida*. Of the latter species, I have long possessed one which I regarded as *A. japonica*, Borm. ; later, I acquired a male and two females, labelled by de Bormans himself, "*A. japonica*, Borm." As a matter of fact, the forceps are entirely different from those of the true *A. japonica* ; the latter species could be placed in *Apterygida* with justification, but still it is impossible to separate it from *O. harmandi*, which certainly requires the erection of a new genus ; the females of the two new species are almost identical.

TABLE OF SPECIES.

1. Forcipis bracchia ♂ dente valido obtuso deorsum ac introrsum spectanti, haud bifido, armata. (Abdomen subparallelum, vix dilatatum).	1. *japonica*, Borm.
1.1. Forcipis bracchia ♂ dente valido apice bifido, sursum ac introrsum spectanti, armata.	
2. Abdomen ♂ breve, depressum postice valde dilatatum; segmentum ultimum dorsale margine postico fortiter tuberculatum; pedes breviores	2. *harmandi*, sp. n.
2.2. Abdomen ♂ longius, minus depressum ac dilatatum, apice paullo angustatum; segmentum ultimum dorsale ♂ margine postico leviter tuberculatum. Pedes longiores .	3. *lewisi*, sp. n.

Odontopsalis harmandi, sp. n.

Corpus robustum, depressum; colore fusco-castaneo; antennæ brunneæ; pronotum transversum, latius quam longius, quam caput æque latum, margine antico recto, lateribus parallelis, margine postico rotundato, angulis rotundatis, medio paullo elevatum, sulculo medio impresso, lateribus paullo reflexis. Elytra lata, lævia, apice truncata; alæ sordide flavæ, vel flavo-brunneæ, apice infuscatæ. Pedes breves, inerassati, castanei. Abdomen depressum, apud ♂ usque ad apicem sensim dilatatum, apud ♀ minus depressum, subdilatatum, apice attenuatum; segmentum ultimum dorsale breve, truncatum, læve, medio impresso, margine ipso postico medio reflexo, ita tuberculum obtusum triangulare formanti, supra insertionem forcipis utrinque tuberculo valido magno mammæformi instructum; ♀ parvum, declive, haud vel vix tuberculatum. Pygidum ♂ haud prominens, brevissime, obtusissimum; ♀ breve, quadratum. Forcipis bracchia: ♂ robusta, basi triquetra, brevia, sensim incurva, margine superiori dente robusto valido sursum atque introrsum spectanti, apice bifido, acute bimucronato, amata, apicibus haud attingentibus. ♂ (? ♀).

	♂	
Long. corporis	9·25–9·75	mm.
Latit. minim. abdom. . .	2·5 -3	,,
,, max. ,, . .	3·75–4	,,
Long. forcipis	2·5–2·75	,,

Hab. JAPAN, CENTRAL. 3 ♂♂, 1 ♀ (*J. Harmand*, 1900. Mus. Paris).

This species has the appearance of a *Chelidura* or *Gonolalis*, quite different from *Apterygida*. The stout build, strong toothed forceps and general form lead me to separate it even from that heterogeneous group.

Odontopsalis lewisi, sp .n.

Nigra, vel fusco-castanea, alis flavescentibus, nigro-maculatis. *O. harmandi* vicina ; ab eo differt, statura majore, minus depresso, colore fusciori, abdomine minus dilatato ac deplanato, segmento ultimo dorsali ♂ tuberculis minimis instructo, forcipe graciliori, longiori, dentibus minus validis, pedibus longioribus, gracilioribus. ♂ ♀.

	♂	♀
Long. corporis . . .	14 mm.	12·5–13·75 mm.
Latit. minim. abdom. .	2·5 „	—
„ max. „ .	4 „	—
Long. forcipis . . .	4 „	2·5–3 „

Hab. JAPAN, Yeso (1 ♂, 1 ♀, *Bonnet*, 1886, now in my collection); Hako, on trees, 12 v. '81, 1 ♀ (*G. Lewis*, ex Coll. de Bormans, now in my collection); "JAPON," 1 ♂, 1 ♀ (my collection); "JAPON CENTRAL," 2 ♀♀ (*J. Harmand*, 1900; Mus. Paris). (Type in my collection.)

The three specimens in my possession which came from de Bormans' collection were determined by that author as *Apterygida japonica*, Borm., but the forceps are totally different from those of the true *A. japonica*, as described and figured by de Bormans, and in the Paris collection there is a male which corresponds exactly with de Bormans' description.

The females of these two new species are extremely alike; the ♂ and 3 ♀♀ in the Paris collection are very dark in colour, but the male and female in my collection, from the same locality, rather approach *O. harmandi* in colour—that is to say, are much paler It is possible that these two species are not really distinct, but that it is a single species, in which the male is dimorphic.

Apterygida bonchampsi, sp. n.

A. erythrocephala, Oliv., valde affinis. Caput, antennæ, pronotum, elytra, alæ, pedes flava ; abdomen forcepsque rubra. Antennæ totæ

flavæ, segmento 2 minimo, 3, 4 ceteris que longioribus, 13-segmentatæ; pronotum longius quam latius, capite paullo angustius, postice quam antice paullo latius, margine antico recto, postico subrotundato, medio paullo elevatum, flavum, lateribus pellucidis. Elytra longa, flava, sutura anguste fusco-vittata; alæ flavæ; pedes toti pallidi, flavi. Abdomen rufum, cylindricum, tuberculis lateralibus distinctis, nigro-circumdatis; segmentum ultimum dorsale ♂ transversum, margine postico supra insertionem forcipis subtuberculatum, apud ♀ postice leviter angustius, vix tuberculatum. Pygidium, ♂ transversum, quadratum, simplex, margine postico recto, ♀ conicum, apice truncatum. Forcipis bracchia: ♂ basi remota, gracilia, margine, interno basi dente depresso acuto armata, dehinc minute crenulato, pone medium dente parvo interno armata, subflexuosa, apicibus attingentibus; ♀ longa, subrecta, levissime flexuosa, basi margine interno subdentata, dehinc inermia, simplicia. ♂ ♀.

	♂	♀
Long. corporis . . .	12–12·5 mm.	10·5–12 mm.
„ forcipis . . .	4–4·5 „	4 „

Hab. Abyssinia, 4 ♂♂, 2 ♀♀ (Mission de Bonchamps, *Ch. Michel* et *M. Potter*, 1899; Mus. Paris).

This fine species is closely allied to *A. erythrocephala*; it differs in its paler colour, the fore part of the body being entirely clear yellow, except a narrow sutural band down the elytra, which is a little darker; in the form of the forceps, which have the inner margin crenulated and armed with a tooth at the second third of their length; the branches are also less regularly curved, but gently sinuate; in the female, the branches are longer than in *A. erythrocephala*, less straight and armed near the base on the inner margin with a small blunt tooth.

Apterygida vishnu, sp. n.

Corpus elongatum, gracile. Color rufo-brunneus. Antennæ 10-segmentatæ, nigræ, unicolores, sparsim pallido-pubescentes; segmento 2 minimo, a 3 vix diviso, 3 longo, 4 quam 3 paullo brevius, ceteris elongatis. Caput fusco-rufum, læve, nitidum. Pronotum capite vix angustius, quadratum, margine antico recto, postico subrotundato, læve, nigrum, nitidum, lateribus et postice pallido-marginatum. Elytra lævia, rufo-brunnea. Alæ longæ, fuscæ, extus rufo-vittatæ, apice suturæ pallido-punctatæ. Pedes fusci, tarsis pallidioribus. Abdomen gracile, apicem versus attenuatum, minutissime punctulatum, fusco-rufum vel nigrum, tuberculis lateralibus

valde perspicuis ; segmentum ultimum dorsale rufo-nigrum, transversum, margine postico subrecto, medio impressum, supra insertionem forcipis obtuse subtuberculatum, angulis externis posticis rectis. Pygidium vix vel haud perspicuum, breve, obtusum. Forcipis bracchia : ♂ basi remota, gracilia, valde elongata, subrecta, apicem versus ovato-incurva, apicibus ipsis attingentibus vel decussatis, paullo ante medium margine interno dente valido acuto, nonnihil sursum oblique spectanti, armata. ♂. ♀ ignota.

	♂
Long. corporis . . .	8·5–10 mm.
„ forcipis . . .	5–8 „

Hab. INDIA BOREALIS, Dardjiling (*Harmand*, 2854–90 ; 4 ♂♂ ; Mus. Paris).

Allied to *A. sansibarica*, Karsch., and *A. mackinderi*, Burr, falling into the group with long slender forceps, unspotted elytra, unicolorous antennæ, simple pygidium, unarmed last dorsal segment, and fully-developed wings.

Forficula mikado, sp. n.

Statura robusta ; colore rufo-castaneo, elytris alisque pallidoribus. Caput fusco-rufum, suturis haud perspicuis ; antennæ brunneæ, 12-segmentatæ, segmento 2 minimo, 4 quam tertium paullo breviori. Pronotum latum, capite vix angustius, fusco-rufum, pallido-marginatum, margine antico recto, angulis haud rotundatis, margine postico angulisque posticis rotundatis, prozona tumida, interdum utrinque tuberculo minimo indistincto instructa, metazona deplanata, lateribus reflexis. Elytra unicoloria fusca vel fusco-testacea ; alæ fusco-testaceæ. Pedes longi, fusci vel fusco-testacei. Abdomen fusco-castaneum, nitens, pone medium paullo dilatatum, plicis lateralibus distinctis ; segmentum ultimum dorsale ♂ transversum, latum, breve, medio impresso, sulculo obsoleto instructum, margine ipso postico medio triangulariter reflexo, utrinque supra insertionem forcipis obtuse-tuberculato ; segmentum penultimum ventrale transverso ovale, ultimum totum obtegens. Pygidium ♂ breve, quadratum, prominens, angulis posticis tuberculo minimo obsoleto instructis. Forcipis bracchia ♂ depressa, elongata, basi ipso dilatata ac deplanata, hac parte dilatata dente interno obtuso terminata ; dehinc bracchia recta, inermia, simplicia, deplanata, apicibus ipsis incurvis, haud decussatis. ♂. ♀ ignota.

	♂
Long. corporis . . .	8–11 mm.
„ forcipis . . .	3–6 „

Hab. Japan, Central; 7 ♂♂ and a fragment (*J. Harmandi*, 1900).

This species presents the same dimorphism that is common in many earwigs, that is, there are two forms, *macrolabia* and *microlabia*. It is a very distinct species, distinguished by the unspotted elytra, compressed body, square pygidium, and the form of the forceps. It is, perhaps, in intermediate form between *F. lurida* or *F. auricularia* and *F. smyrnensis*.

Forficula planicollis, Kirb.

Statura minore; colore castaneo, vel fusco-testaceo, nigro-variegato. Caput atrum, vel rufo-fusco-castaneum; antennæ testaceæ, 12-segmentatæ. Pronotum capite haud vel vix angustius, latius quam longius, margine antico recto, postico rotundato, lateribus parallelis, colore toto nigro, lateribus plerumque pallido-marginatis; prozona paullo tumida, sulculo medio vix perspicuo instructa; lateribus ipsis paullo reflexis; metazona plana. Elytra alæque ampla, lævia, unicoloria testacea. Pedes testacei, vel rufo-testacei. Abdomen fusco-castaneum, nitidum, minutissime punctulatum, tuberculis lateralibus distinctis nigro-circumdatis; apud ♂ plus minus deplanatum, depressum, usque ad secundam tertiam longitudinis dilatatum, dehinc angustatum, apud ♀ minus vel vix dilatatum: segmentum ultimum dorsale ♂ angustum, breve, utrinque supra insertionem forcipis obtuse tuberculato, apud ♀ brevissime, angustum, tuberculis obsoletis. Pygidium haud perspicuum. Forcipis bracchia: ♂ inermia, deplanata, tantum per quartam partem longitudinis dilatata ac contigua, hac parte margine interno minute denticulata, superne leviter tumida; dehinc divergentia, tum convergentia, aream ovalem includentia, haud decussata; ♀ subcontigua rectissima, apice leviter decussata. ♂ ♀.

Variat: colore toto rufo-nigro, pedibus rufescentibus, forcipis bracchiis pone partem dilatatum fortius divergentibus, tum fortius incurvis, aream rotundatam includentibus. ♂.

	♂	♀
Long. corporis . . .	7-9 mm.	—
Lat. max. abdom. . .	2·25 „	—
Long. forcipis . . .	2–2·75 „	2 mm.

Hab. "Nord des Indes Orientales, Dardjiling," 2 ♂♂, 1 ♀; "Montagnes, 1886" (*J. Harmand*, 1 ♀, 2854, 1890; Mus. Paris).

These specimens agree with Kirby's type, which is in

very bad condition, and a female. The ♂ has been hitherto unknown.

Forficula ambigua, sp. n.

F. planicolli vicina ; ab ea differt: (1) colore pallidiori, haud nigro-variegato, capite fusco-rufo, pronoto rufo, lateribus pellucidis, (2) pronoti marginibus deplanatis nec reflexis, (3) abdomine cylindrico, haud vel vix dilatato, minus depresso, (4) forcipis bracchiis ♂ basi ipso tantum dilatato, dehinc subrectis haud vel vix divergentibus, leviter incurvis. ♂ ♀.

	♂	♀
Long. corporis . . .	9·5 mm.	8·25–9 mm.
Lat. max. abdom. . .	2 „	—
Long. forcipis . . .	2·5–3 „	2 „

Hab. DARDJILING ; 2 ♂♂, 3 ♀♀ (*J. Harmand*, 2854, 1890. 1 ♀ i. Montagnes, 1886).

One of the males of this species affords a transition from the preceding species, in having the colour of *F. planicollis* and the form of *F. ambigua*. The two forms are so closely allied that the females alone can be distinguished only by their colour. *F. ambigua* approaches nearly to *Apterygida*.

Forficula mogul, sp. n.

Statura majore, robusta. Caput nigrum, occipite rubro : antennæ . . . ? Pronotum quadratum, haud latius quam longius, margine antico recto, postico rotundato, colore fusco-castaneo, lateribus deplanatis, pellucidis ; prozona leviter tumida, medio carinula brevissima vix perspicua, bifurcata, metazona media carinula obsoleta, instructis. Elytra brevia, apice truncata, sublævia, rufo-fusco-testacea ; alæ eodem colore, apice nonnihil infuscatæ. Pedes validi, rufo-testacei. Abdomen rufo-nigrum, tuberculis lateralibus distinctis, segmentis totis minutissime punctulatis ; segmentum ultimum dorsale ♂ transversum, læve, haud punctulatum, obtuse tuberculatum utrinque supra insertionem forcipis, apud ♀ angustum, tuberculis obtusioribus ; segmentum penultimum ventrale rotundatum, segmentum ultimum fere totum obtegens. Pygidium ♂ breve, truncatum, ♀ haud perspicuum. Forcipis bracchia rufa, apice infuscata, tota punctulata, valida, robusta, deplanata ; ♂, basi dilatata ac deplanata, per tertiam partem longitudinis, hac parte margine interno fortiter denticulata, dehinc attenuata, recta, apicem versus sensim incurva, ♀ subrecta, contigua, haud dilatata, apice decussata. ♂ ♀.

	♂	♀
Long. corporis . . .	16 mm.	—
„ forcipis . . .	5 „	4 mm.

Hab. DARDJILING; 1 ♂, 1 ♀ (*J. Harmand*, No. 2854, 1890).

This species resembles *F. ruficollis* from Spain, but the head is not entirely black, the pronotum is square not oblong, the wings are well developed, the elytra unspotted.

Forficula beelzebub, Burr.

I described this insect as a *Chelisoches* in the Annales de la Soc. Entom. de Belgique, Tome xliv, p. 51 (1900), from a single specimen; in colour and appearance it resembles *Chelisoches morio*, which led me to range it in that genus, but in the Paris collection I have been able to examine a more complete series, and so have been able to see more clearly the form of the second tarsal segment; there is no doubt that it is a true *Forficula*. The male appears to be dimorphic in the form of the forceps; the form which I described as typical corresponds to the varieties *macrolabia*, *forcipata*, etc. of our European Forficulæ, but there are some specimens with much shorter forceps in the Paris collection, which are, perhaps, the typical form; from my description, the following words must be suppressed, "*bracchio sinistro* (*forcipis*) *quam dextro plus incurvo*"; I was misled by the condition of the single male which was the type, and the series in the Paris collection shows that both branches of the forceps are equally curved.

It is easy to recognize by its black colour, with no lighter markings.

XIV. *Further Notes on* Hydroptilidæ *belonging to the European Fauna, with descriptions of new species.*

By Kenneth J. Morton, F.E.S.

[Read March 2nd, 1904.]

Plate XXI.

Since the publication of my former notes in the Transactions of this Society (1893, pp. 75–82), a great advance has been made in our knowledge of these minute insect forms, not only with respect to the insects themselves but also with regard to their life histories. With the latter side of the subject I do not propose to deal here at all, but would refer to the exhaustive list of publications given in Ulmer's Memoir "Über die Metamorphosen der Trichopteren" (Abhandlungen aus dem Gebiete der Naturwissenschaften, heraus: vom Naturwissenschaftlichen Verein, Hamburg, Bd. xviii).

The object of my notes, in addition to the primary one of giving descriptions of two new species, is to call attention to the species which have been described since my former paper, and also to give further details which have since been ascertained regarding the geographical distribution of some of the species. For material beyond the results of my own collecting, I am indebted to Professor Klapálek, Dr. Fr. Ris, and especially to Herr A. J. Silfvenius of Helsingfors, from whom I received a most extensive collection of *Hydroptilidæ* for examination.

Agraylea multipunctata, Curt.

Seen in great quantity from several Finnish localities. I have taken it in Norway.

A. cognatella, McL.

This is a critical species. One example taken by myself in Norway, I have referred to this species, but in the large collection sent from Finland by Herr A. J. Silfvenius, including material both dry and in alcohol, there was none that I could separate satisfactorily from *A. multipunctata*.

A. pallidula, McL.

In the above-mentioned collection from Finland, there was a single ♀ which I determined as *pallidula* with some hesitation. Recently, however, Herr Silfvenius has sent nymphs in which the ♂ appendages are fully mature, and these confirm, beyond all question, the existence of this interesting species in Finland.

Allotrichia pallicornis, Eaton.

In addition to the localities recorded by McLachlan, Klapálek adds Bohemia and Bosnia. It has also been taken by Eaton in Algeria. In our own Islands it swarms on the river Clyde at Uddingston near Glasgow.

Hydroptila sparsa, Curt.

The examples from Portugal referred here by McLachlan with some doubt prove to be a good new species. *H. sparsa* is, however, quite likely to prove a native of the Iberian peninsula, as it is found at Pavia in Italy (*Ris*) and in Algeria (*Eaton*).

H. campanulata, Mort.

A near ally of *H. sparsa* taken by Eaton in Algeria, and described by me in E. M. M., 2nd Ser., vol. vii, p. 103.

Hydroptila cintrana, n. sp.

The pubescence of the fore-wings is brownish (no doubt black when fresh) with white markings, of which the principal are two oblique bands somewhat interrupted; there is also a noticeable dark apical spot margined internally with white.

The outer margin of the dorsal plate of the ♂ is slightly upturned; in the dry insect the plate becomes retracted going towards the base, the large side flaps of the plate falling inwards towards the chitinous lines which seem to form the supporting framework of the plate when this is viewed from above: the conformation of the angles of the outer margin and of the apex of the flaps from the vertical view gives the impression of acute points in the preparation from which the figures are made, but this is probably exaggerated. The distal portion of the inferior appendages is slender; these appendages are divergent, slightly hooked at the apex which is piceous; there is also a piceous wart before the middle of the appendage.

Hab. CINTRA, PORTUGAL, 26th and 27th April (*Eaton*).

This species is closely allied no doubt to *H. sparsa*, but it may be distinguished at once by the entire margin of the dorsal plate, which in *H. sparsa* is very distinctly notched. The warts on the middle of the inferior appendages appear to be absent in the latter insect. The subapical process of the penis is also more pronounced and more spirally twisted than in *H. sparsa*.

Hydroptila tigurina, Ris (Mitt. Schweiz. entom. Gesellschaft, Bd. ix, p. 133).

This species described by Ris from Zürich, has been taken by King at Ambleside in the English Lake District.

H. rheni, Ris (Mitt. Schweiz. entom. Gesellschaft, Bd. ix, p. 241).

From the Rhine between Rheinau and Ellikon; not yet known from any other locality.

H. sylvestris, Morton (E. M. M., 2nd Ser., vol. ix, p. 107).

Remains unknown except from the original locality in Scotland.

H. serrata, Morton (E. M. M., 2nd Ser., vol. ix, p. 108).

Is known only from Algeria.

H. maclachlani, Klap.

In addition to the localities recorded by Klapálek and myself, is found in Switzerland (Valais, *Paul;* Liestal, *Ris*); Basses Alpes (Digne, *Morton*), and Algeria (*Eaton*).

H. insubrica, Ris (Mitt. Schweiz. entom. Gesellschaft, Bd. xi, p. 16, 1903).

Recently described by Ris from examples taken by him at Mendrisio in the Canton Ticino.

Ithytrichia lamellaris, Eaton.

Occurs in Finland (*Silfvenius*).

Microptila minutissima, Ris (Mitt. Schweiz. entom. Gesellschaft, Bd. ix, p. 417).

A particularly interesting little form described from examples from Zürichberg near Zürich.

Stactobia fuscicornis, Schn.

More detailed figures of the ♂ appendages are given by Ris in Mitt. der Schweiz. entom. Gesell., Bd. ix, p. 418.

S. catonianella, McL.

Klapálek (Bull. internatl. de l'Académie des Sciences de Bohême, 1900) describes and figures the preparatory stages of this species. He also figures the apex of the ♂ abdomen, but the penis is not exserted, and I am unable to say how the structure as a whole compares with that of the other two species.

S. atra, Hagen.

I am indebted to Mr. McLachlan for the opportunity of examining abundant material (dry and in alcohol) of this species collected by Mr. Eaton.

In some of these examples the parts are strongly exserted, and I was enabled to obtain a much more satisfactory knowledge of the structure than formerly. My earlier figures were taken from an example in which the parts were retracted, with the result that Ris quite naturally concluded that these parts showed only a remote similarity to those of *S. fuscicornis*. The figure now given will on the contrary, I think, serve to emphasize the connection between the two, and will also help to explain the homologies of the individual parts.

Orthotrichia augustella, McL.

Appears to be less common, in Northern Europe at least, than the following. Its distribution is, however, imperfectly known. I have seen it from Algeria (*Eaton*).

O. tetensii, Kolbe.

This species has been more fully elucidated by Klapálek. I have taken it in Scotland, and amongst a large number of examples of *Orthotrichia* seen from Finland, it was the only species of the genus represented.

Oxyethira ecornuta, Mort.

Numerous examples have been seen from Finland (*Silfvenius*).

O. falcata, Mort.

Probably widespread. Recorded from Switzerland by Dr. Ris, and taken by Mr. Eaton in Algeria. I have just seen a ♂ from Tangiers, Morocco (*Lord Walsingham*), in Mr. McLachlan's collection.

O. frici, Klap.

Taken in Norway by Eaton and myself. I have also seen a ♂ taken by King at Rothiemurchus, Inverness-shire.

O. tristella, Klap. (E. M. M., 2nd Ser., vol. vi, p. 168).

Described by Klapálek from Bohemia; it has since been taken in two localities in Scotland (Wigtownshire and Perthshire).

Oxythira mirabilis, n. sp.

In the ♂ the last dorsal segment has the margin rounded with a small, rather deep notch in the middle. The sides of the last segment are semi-circularly produced forming opposing valves (within which are placed the appendages), giving the whole segment an elongated appearance. The ventral plate has the whole outer margin occupied by a deep V-shaped excision; the plate becomes slightly broader towards the base. Above this plate is a large, prominent cover convex beneath and slightly turned downwards; on either side of the ventral plate is a slender aristate appendage. The penis has the apex much swollen for a considerable space, the expansion being greatest at the tip; it is accompanied by a pair of acute sheaths. Ventral tooth small and acute.

Hab. Loch Eigheach, Rannoch, Perthshire (*Morton*).

A single specimen was taken, and as this was made into a microscopical preparation before I could satisfy myself with regard to its structure, I am unable to give any details as to its general appearance. The genitalia are very different from those of any other known *Oxythira*, and the species probably forms an addition to the already numerous groups of which this extensive genus consists.

The locality which produced this interesting species is an expansion of the river Gaur in the Moor of Rannoch. It was taken along with a few *O. sagittifera*, Ris (also new to the British fauna), and *O. costalis* was also present. I was unable to revisit the locality, and my wife, who went there twice subsequently, failed to find either of the desired species, but took *O. tristella*, Klapálek.

O. simplex, Ris (Mitt. Schweiz. entom. Gesell., Bd. ix, p. 420).

Described from Switzerland, occurs in different parts of Scotland about springs, sometimes where there is no surface water in summer, the moisture being all absorbed by sphagnum or moss.

O. distinctella, McL.

Taken in Norway (Morton). Thanks to Silfvenius, I have seen abundant material of this species from Finland, and I am enabled to give a better figure of the dorsal processes (called by me superior appendages).

O. sagittifera, Ris.

Was described (*op. cit.*, p. 421) from a unique specimen taken at the Hausersee, near Ossingen. A single ♂ from Finland was subsequently seen by me and referred with a little hesitation to this species, but all doubt was removed by the capture of 3 ♂ and a few ♀ at Rannoch, Perthshire, in the past summer. Silfvenius has also been successful in again finding the species, and I have now, through him, examined a great number of specimens. For the sake of comparison, I give a figure of the dorsal process. I may add that in a preparation made from a Finnish example there are four teeth on this process instead of three, the additional tooth being large and conspicuous.

O. felina, Ris (*op. cit.*, pp. 422–3).

Described from a single ♂ reared from material from the Katzensee. This is the only European species of the genus which I have not personally examined.

Explanation of Plate XXI.

1. Apex of abdomen of *Hydroptila cintrana* from above.
2. „ „ „ „ beneath.
3. „ „ „ „ side.
4. „ „ *Stactobia atra* from beneath.
5. „ „ *Oxyethira mirabilis* from beneath.
6. Last dorsal segment of *Oxyethira mirabilis*.
7. Dorsal process of *Oxyethira distinctella*.
8. „ „ „ *sagittifera*.

June 15th, 1904.

XV. *Notes on Australian and Tasmanian* Cryptocephalides, *with Descriptions of New Species.*

By Arthur M. Lea, F.E.S.

[Read March 2nd, 1904.]

Plates XXII, XXIII, XXIV, XXV and XXVI.

There are in Australia few subfamilies of Coleoptera in which so many genera have been proposed on such slight grounds as in the *Cryptocephalides*. As a matter of fact any one desiring to work at Australian Coleoptera, of almost any family, would do well to note that the genera have not the stability of the older characterized European ones; and that, before describing new species, it is often necessary to examine the descriptions of all the species referred to a subfamily. Nor is this always sufficient, for even many of the subfamilies (especially in the *Rhynchophora*) are in very unsatisfactory condition.

Dr. Baly,* in proposing several new genera and trying to re-establish several others (regarded by some entomologists as of sectional importance only), remarks on the loss of time involved in wading through a mass of descriptions that would be saved were the genera split up into smaller ones. But it is not sufficient that the genera should be split up into smaller ones only, but that if this is done the genera should be founded on such characters as will enable future workers to identify them without much chance of misconception; and this is far from being the case with the Australian *Cryptocephalides*. Saunders and Baly regarded the antennæ and prothoracic margins as the main distinguishing features, whilst Suffrian and Chapuis relied mainly on the prosternum; in consequence we have many species which it is possible to refer to any of several genera, whilst many closely allied species would be widely separated no matter whether reliance was placed chiefly on Chapuis or on Baly. The characters of genera must indeed be regarded as very artificial when the male and female have been referred to different genera, even sometimes by the same author. So far as the Australian

* T. E. S., 1877, part 1, p. 23.

species of the subfamily are concerned, I believe there would be fewer synonyms and less mistakes made, if most of them were regarded as belonging to one comprehensive genus.

After sorting out *Diandichus, Schizosternus,** *Cyphodera, Brachycaulus* and *Lachnabothra* there remains a mass of species referred to *Cryptocephalus, Loxopleurus, Cadmus* and various other genera or subgenera.† Certainly some of these appear to cluster in groups, and the characteristic species of these groups can be readily distinguished from characteristic species of other groups; but there are so many intermediate species that it seems to me *no* natural system can be devised for sorting the species into stable genera. In the new species I have briefly noted the characters of each species that are supposed to be its distinguishing generic features, and have purposely refrained from proposing fresh generic names, placing the more aberrant species at the end of *Cryptocephalus.*

Dr. Chapuis after describing *Cadmus cariosus* says:— "Il se rapproche du *Cadmus subsulcatus,* Suffr. (*Ochrosopsis rufescens,* Saund.) que nous avons du placer dans le genre *Cadmus* en égard à son prosternum dont la base est plus ou moins arrondie. La distinction entre les deux formes est facile." He himself however refers to *Cadmus* a species *C. quadrivittatus*‡ in which the intercoxal process is rather deeply emarginate, although in general appearance it is a normal *Cadmus*; in *Cadmus luctuosus,* Chp., this part is again decidedly emarginate, although not so deeply as in *quadrivittatus.*

Loxopleurus is supposed to be distinguished by the intercoxal process of prosternum being drawn out into a blunt triangular tip. The majority of the species standing in the catalogue under *Loxopleurus* were described by Chapuis, but on examining *L. genialis,* Chp., I find that it is decidedly bilobed; in *L. chalceus,* Chp., it appears at first sight to be widely truncate, but on close examination it can be seen to be feebly bilobed, although the lobes are occasionally more or less obscured by the clothing.

* The deeply emarginate prosternum is the only really valid feature of this genus, and this is but an exaggeration of the bilobed apex of *Cryptocephalus.*

† In this paper I am not dealing with *Ditropidus Elaphodes* and the genera closely allied to them.

‡ This species is so distinct that I cannot be mistaken in my identification.

The synonymy is very intricate owing to the great variation in many species, both sexually and individually, and to the trivial distinctions which have been considered sufficient to separate the genera and subgenera. Fortunately Mr. George Masters, to whom I am especially indebted, and from whom either directly or indirectly a large proportion of the previously described species were obtained, including many by Chapuis, has for many years carefully preserved specimens obtained *in copula*, and of these I have had access to all those in his own and the Macleay Museum collections (now amalgamated). I have also myself for about fifteen years paid particular attention to specimens obtained *in copula*.

I have probably had before me a much larger collection, both of species and specimens, of Australian *Cryptocephalides* than any previous entomologist; even with this advantage I have not considered it advisable to attempt to apportion the previously described species into genera, preferring to refer to them by the genus in which they were originally placed,* as I do not believe that stable genera can be defined and maintained. To refer them all to *Cryptocephalus* (as with few exceptions I think they should be) would necessitate a number of names being changed through having been twice used.

The Australian genera and subgenera here dealt with are:—*Aporocera*, *Brachycaulus*, *Cadmus*, *Chariderma*, *Chloroplisma*, *Cryptocephalus*, *Cyphodera*, *Dianulichus*, *Dicenopsis*, *Euphyma*, *Idiocephala*, *Lachnabothra*, *Loxopleurus*, *Mitocera*, *Ochrosopsis*, *Odontoderes*, *Onchosoma*, *Paracadmus*, *Paracephala*, *Prasonotus*, *Prionopleura*, *Rhombosternus* and *Schizosternus*. I have not only checked the descriptions of all the species † referred to these genera, but of all other species of the subfamily recorded from Australia and Tasmania.

In general, so far as the new species are concerned, where the hinder apex of the intercoxal process of prosternum is feebly or moderately bilobed, I have referred the species to *Cryptocephalus*; where it is semicircularly

* Except in the case of *Lachnabothra braccata*, Klug, originally referred to *Chlamys* with a query, and *Cryptocephalus crassicornis*, Chp., again formally described, but now referred to *Schizosternus*.

† I have not seen the description of *Cryptocephalus laevicollis*, Gebler, and its variety *arennensis*, Weise; nor have I seen the description of *axillaris*, Sturm, given in Masters' Catalogue as a synonym of *elegans*, Saund.

or triangularly excised to *Schizosternus*; where subtriangularly produced in the middle to *Loxopleurus*; and where rounded or truncate to *Cadmus*. I have not invariably, however, carried this out, as it would in a number of instances separate very closely allied species; I have, however, given my reasons under such species for not following these general rules.

Besides the species here noted or described I have critically examined more than fifty others, which for various reasons (but principally on account of their being represented by damaged or unique specimens) I have considered inadvisable to describe.

It will be seen by the accompanying table that many apparently congeneric species are widely separated, and others apparently belonging to different genera are brought together; showing how totally unreliable are many of the characters relied upon for distinguishing genera; for in the table itself I have purposely used the features relied on for separating the genera; and as a rule I have only used colours to distinguish closely allied species, and not often then, preferring to rely on constant structural characters.

Very useful distinguishing features are to be found in the abdomen in both sexes of many species; and with few exceptions the abdomen has been entirely neglected. The shape of the scutellum is often exceedingly useful in distinguishing closely allied species. The female as a rule is larger and wider, with the eyes smaller and more distant and the head less coarsely punctured; consequently when describing the sexual differences I have seldom considered it necessary to mention these. The antennæ are nearly always shorter in the female than in the male, although not always thinner. I have considered it necessary in almost every case to describe the hinder apex of prosternum, and the second, third and fifth joints of antennæ.

Most of the specimens described from the Macleay Museum collection were taken by Mr. Masters, but in that institution the collector's name is seldom attached to the locality label. I have considered it necessary to mention in whose collection I have seen species or varieties of which I do not myself possess specimens, as this may be of assistance to future workers. When not otherwise stated the types of the new species remain in my

own collection. Although many of the varietal forms here described are very distinct, I have not attached varietal names to any of them.

The following references have been omitted from Masters' Catalogue of Australian Coleoptera:—

Idiocephala Roei var. atripennis, Saund., T. E. S. (1845), p. 143.

Hab. Not given.

Cryptocephalus eximius, Chp., A. S. E. Belg. (1875), p. xciii.

Hab. Brisbane.

C. conjugatus, Chp. *l.c.*, p. xcvi.

Hab. Port Denison.

C. mercator, Suff., Linn. Ent. (1859), p. 99.

Hab. Australia.

C. didymus, Fab., Ent. Syst. II, 57, p. 22. Syst. El. II, 43, p. 11; Suff., Linn. Ent. (1859), p. 149.

Hab. Australia.

Loxopleurus nigrolineatus, Chp., A. S. E. Belg. (1876), p. xliii.

Hab. Pine Mountain.

In the catalogue also there should have appeared two species bearing the name *Prasonotus morbillosus* as follows:—

P. morbillosus, Baly, T. E. S. (1877), p. 35.

P. morbillosus, Chp., Journ. Mus. Godeffr. xiv, p. 75; Lac., Atl. Plate 115, fig. 5.

The only references I have seen since the date of the catalogue are by the Rev. Thos. Blackburn, as follows:— P. L. S. N.S.W. (1888), pp. 1473–1474; T. R. S. S.A. (1890), pp. 135–137; (1891), p. 139; (1893), p. 140; P. L. S. N.S.W. (1893), pp. 205–207.

TABULATION OF THE SPECIES HERE NOTED OR DESCRIBED.

A. Prothorax with a large tubercular crest along middle . .	*Cy. chlamydiformis*, Germ.
A.A. Prothorax with an elongated tubercle or ridge (sometimes but slightly elevated) on each side of middle. Elytra tuberculate or costate, sometimes both.	
b. Black	*Br. aterrimus*, n. sp.
b.b. Purplish-red with yellowish markings	*Br. mamillatus*, n. sp.
b.b.b. More or less brown or ferrugineous.	
c. Prothorax with three dark velvety rounded spots . .	*Br. ferrugineus*, Fairm.
c.c. Prothorax without these spots.	
d. Elytral costæ sharply defined	*On. klugii*, Snd.
d.d. Elytral costæ not sharply defined.	
e. Size, very large	*Ca. colossus*, Chp.
e.e. Size, very small	*Br. posticalis*, n. sp.
A.A.A. Prothorax bituberculate in male, nontuberculate in female. Femora stout in male. Antennæ very long in male, usually about twice as long as in female.	
b. Basal joint of anterior tarsi of male abnormal	*La. saundersi*, Baly.
b.b. Basal joint normal.	
c. Prothorax with two subacute tubercles in male	*La. waterhousei*, Baly.
c.c. Prothorax with obtuse tubercles in male.	
d. Elytral tubercles narrow and concolorous with derm . .	*La. braccata*, Klug.
d.d. Elytral tubercles rather wide and much darker than derm	*La. wilsoni*, Baly.
A.A.A.A. Prothorax nontuberculate.	

B. Scutellum very narrow. Abdominal fovea of female unusually large.	
c. Prothorax red in female, black in male	*Di. analis*, Chp.
c.c. Prothorax black in both sexes	*Di. foveiventris*, n. sp.
B.B. Scutellum minute.	
c. Prothorax entirely dark, apex of abdomen red	*Pr. ruficaudis*, Baly.
c.c. Prothorax red (at most clouded with black), abdomen entirely dark	*Pr. submetallicus*, Suff.
B.B.B. Scutellum transverse or not much longer than wide, or if moderately long then abdominal fovea of female below normal size.	
C. Hinder apex of intercoxal process of prosternum deeply incised or semicircularly emarginate.*	
d. Fifth joint of antennæ much wider than tenth	*Ch. pulchella*, Baly.
d.d. Fifth joint much narrower than tenth.	
e. Prothorax deeply constricted on each side in front so that the anterior angles project strongly outwards.	
f. Prothorax and elytra (except at junction of same) of uniform colour	*Sc. delicatulus*, n. sp.
f.f. Prothorax and elytra variegated.	
g. Elytra with longitudinal markings	*Sc. trilineatus*, n. sp.
g.g. Elytra more or less distinctly fasciate.	

* *Cryptocephalus filum*, Chp., referred to *Paracephala* by Baly, is included here, as the emargination although not deep might fairly be called semicircular ; *Cr. cariniventris*, n. sp., should perhaps have also been referred to this section ; it is, however, obviously so very close to *Cr. lurinus*, n. sp. (in which the apex is feebly bilobed), that I thought it best not to separate them.

h. Upper surface black with obscure reddish markings . .	*Sc. albogularis*, Chp.
h.h. Upper surface red with black markings.	
i. Metasternum and legs black .	*Sc. coccineus*, Chp.
i.i. Metasternum and greater part of legs pale	*Cr. filum*, Chp.
e.e. Prothorax not so constricted.	
f. Elytra with numerous irregular markings	*Sc. marmoratus*, n. sp.
f.f. Elytral markings sutural . .	*Cr. crassicornis*, Chp.
C.C. Hinder apex of intercoxal process of prosternum bilobed.*	
D. Fifth joint of antennæ much wider than tenth.	
e. Elytra except the outer margins, entirely dark . .	*Ap. bicolor*, Snd.?
e.e. Elytra dark only at apex . .	*Ap. apicalis*, Snd.
D.D. Fifth joint of antennæ much narrower than tenth or at most just perceptibly wider.	
E. Serrations of joints of antennæ of male reversed after the seventh.	
f. Elytra with transverse fasciæ .	*Cr. bihamatus*, Chp.
f.f. Elytra non-fasciate	*Cr. distortus*, n. sp.
E.E. Serrations of joints of antennæ nowhere reversed.	
F. Prothoracic margins crenulate.†	

* In a number of cases it is very difficult to tell without examining it from all directions as to whether it is feebly bilobed or truncate, especially when it is at all depressed. In *Cr. terminalis*, Chp., *Eu. flaviventris*, Snd., *Ap. apicalis*, Snd., and *Ap. bicolor*, Snd., it is very indistinctly bilobed. I have placed *Ca. quadrivittatus*, Chp., here although it might fairly have been placed with those having the apex semicircularly emarginate. In *Cr. distortus*, n. sp., the apex is wide and at a glance appears to be truncate, it is, however, very feebly incurved, so I have included it in this section.

† In these species the upper surface is opaque (in *Ca. nothus*, n. sp., however, the elytra are slightly shining), the scutellum is more or less distinctly carinate, and the fifth joint of antennæ is longer than the fourth or sixth. *Ca. luctuosus*, Chp., is included here, although the crenulations are by no means sharply defined; in *Pr. cognata*, Snd., the crenulations are sometimes very distinct, at other times the margins appear to be almost unbroken.

g. Eleventh joint (or part of it) of antennæ darker than tenth, at least in male.
h. Elytra with sharply defined black markings, at least in male.
i. Apex of elytra entirely dark in male . . . . . *Ca. luctuosus*, Chp.
i.i. Apex of elytra not entirely dark in male . . . . . *Ca. quadrivittatus*, Chp.
h.h. Elytra without distinct markings . . . . . *Ca. nothus*, n. sp.
g.g. Eleventh joint of antennæ no darker than tenth.
h. At least the five terminal joints of antennæ dark in male . . *Pr. bifasciata*, Snd.
h.h. Antennæ (except sometimes for parts of the basal joints) entirely pallid.
i. Scutellum acutely costate . . *Ca. rugicollis*, Gray.*
i.i. Scutellum rather feebly ridged *Pr. cognata*, Snd.
F.F. Prothoracic margins entire.†
G. Upper surface of uniform colour and brightly metallic.‡
h. Elytra with distinct longitudinal ridges, antennæ (except first and eleventh joints) pallid . . . . . *Cr. metallicus*, n. sp.
h.h. Elytra without distinct ridges, antennæ dark.
i. Elytra densely and irregularly punctate, the punctures fre-

* The species usually regarded as *Cr. rubiginosus*, Boi.

† In a few species they could not strictly speaking be called entire, but at most there are but two feeble notches; the upper surface in most of the species is highly polished, but in a few it is subopaque.

‡ Although the upper surface is more or less uniform there are sometimes various metallic shades of colour, but in none of the specimens is the upper surface diluted with red. *Cr. scabrosus*, Oliv., and allied species (which are black or blue with a metallic gloss) are excluded, and somewhat doubtfully. *Cr. Jacksoni*, Guer. is included.

quently transversely conjoined . . . . . *Cr. viridinitens*, Chp.

i.i. Elytra less densely, and beyond the middle more or less regularly punctate.

j. Body cylindrical, seventh to tenth joints of antennæ in male strongly produced internally . . . . . *Cr. convexicollis*, n. sp.

j.j. Body not cylindrical, seventh to tenth joints of antennæ in male feebly produced on each side . . . . . *Cr. jacksoni*, Guer.

G.G. Upper surface not both of uniform colour and metallic.

H. Eleventh joint of antennæ in male, wider than tenth . . *Cr. clavicornis*, Chp.

H.H. Eleventh joint no wider than tenth, if as wide.

I. Prothorax densely and finely pubescent.

j. Elytra smooth and densely and finely pubescent . . . *Cr. comosus*, n. sp.

j.j. Elytra irregularly costate and rather sparsely and irregularly pubescent . . . . *Cr. incoctus*, n. sp.

I.I. Upper surface entirely or almost glabrous.

J. Scutellum not much narrower at apex than at base.*

k. Abdomen in male with the fourth segment visible only at sides, the fifth unusually large and with a large median excavation.

l. Intercoxal process of mesosternum feebly transverse, its apex quadrisinuate. . . . *Cr. cariniventris*, n. sp.

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* *Cr. parentheticus*, Suff., *Cr. aciculatus*, Chp., and *Id. catoxantha*, Snd., are included here, as the apex is more than half the width of the base, although the sides rather strongly diminish in width from base to apex.

l.l. This process strongly transverse, its apex arcuate . .	*Cr. pœcilodermus*, Chp.
k.k. Abdomen in male with the fourth segment continuous across middle.	
l. Fifth segment of male strongly and almost semicircularly excised in middle of apex .	*Cr. sobrinus*, n. sp.
l.l. This segment at most slightly incurved from sides.	
m. Prothorax densely and coarsely punctate.*	
n. Eleventh joint of antennæ inserted in middle of tenth .	*Cr. clypealis*, n. sp.
n.n. Eleventh joint inserted towards side of tenth.	
o. Scutellum as long as wide . .	*Cr. conspiciendus*, n. sp.
o.o. Scutellum rather strongly transverse	*Cr. tenebricosus*, n. sp.
m.m. Prothorax not both densely and coarsely punctate.	
n. Prothoracic punctures elongate or substrigose	*Cr. aciculatus*, Chp.
n.n. Prothoracic punctures rounded.	
o. Second joint of antennæ less than one-third the length of third.	
p. Scutellum as long as wide . .	*Oc. erosus*, Snd.
p.p. Scutellum strongly transverse.	
q. Under-surface entirely pallid .	*Cr. stenocerus*, n. sp.
q.q. Under-surface black in parts .	*Cr. larinus*, n. sp.
o.o. Second joint about half the length of third.	
p. Fifth joint at least one-half longer than fourth.	
q. Scutellum very strongly transverse	*Cr. rubicundus*, n. sp.
q.q. Scutellum feebly transverse .	*Oc. eruditus*, Baly.
p.p. Fifth joint not much (certainly	

* In the three species included here the punctures are decidedly above the usual size, and are so dense that there is no space without them.

	less than one-half) longer than fourth.	
q.	Prothorax immaculate . . .	*Id. catoxantha*, Snd.
q.q.	Prothorax with three longitudinal vittæ.	*Cr. parentheticus*, Suff.
J.J.	Scutellum more or less triangular.*	
K.	Third and fifth joints of antennæ equal or subequal, and both distinctly longer than fourth.†	
l.	Antennæ thin and almost equal in width throughout.	
m.	Fifth joint much longer than fourth	*Mi. viridipennis*, Snd.
m.m.	Fifth joint not much longer than fourth	*Cr. confinis*, n. sp.
l.l.	Antennæ much stouter than usual	*Cr. antennalis*, Chp.
l.l.l.	Antennæ with the sixth to ninth joints comparatively wide.	
m.	Apex of scutellum rather narrow, but distinctly truncate.	*Cr. variipennis*, n. sp.
m.m.	Apex of scutellum obtusely rounded.	
n.	Lateral margins of prothorax very narrow	*Cr. castus*, Suff.
n.n.	Margins comparatively wide.	
o.	Elytra more or less green (or blue)	*Cr. iridipennis*, Chp.
o.o.	Elytra not at all green . . .	*Cr. purpureotinctus*, n. sp.
K.K.	Third, fourth and fifth joints of antennæ subequal.‡	
l.	Abdomen dark in both sexes .	*Lo. genialis*, Chp.

* Somewhat doubtfully *Cr. conjugatus*, Chp., is included here as the apex is about half the width of the base, but the scutellum is very short, with the sides very rapidly diminishing to the apex.

† In *Cr. confinis*, n. sp., the third and fifth are equal in length and longer than the fourth, although not by much, so that the species might fairly have been placed in the group having the third, fourth and fifth joints subequal.

‡ The fifth, however, is slightly longer than the fourth, although not very distinctly so.

l.l.	Abdomen dark in male only .	*Cr. blandus*, n. sp.
K.K.K.	Third joint but little, if at all, longer than fourth, and distinctly shorter than fifth.*	
L.	Elytra more or less rough.	
m.	Elytra with scar-like tubercles across middle	*Cr. scabiosus*, n. sp.
m.m.	Elytra without scar-like tubercles across middle.	
n.	Elytra with wide, smooth costiform elevations on apical half.	
o.	Prothorax black or blackish .	*Cr. quadratipennis*, n. sp.
o.o.	Prothorax pallid	*Cr. compositus*, n. sp.
n.n.	Elytra roughly punctate throughout	*Cr. scabrosus*, Oliv
L.L.	Elytra smooth.	
M.	Base of scutellum entire.	
n.	Prothorax and elytra entirely dark	*Lo. chalcens*, Chp.
n.n.	Prothorax more or less red.	
o.	Prothorax with dark markings other than at base.	
p.	Elytra pallid at apex only . .	*Cr. lilliputanus*, n. sp.
p.p.	Elytra pallid, with dark markings	*Cr. melanopus*, n. sp.
o.o.	Prothorax with dark markings at base only.	
p.	Head densely strigose along middle, as elsewhere.	
q.	Second joint of antennæ almost as long as third	*Cr. pallens*, n. sp.
q.q.	Second joint not half as long as third	*Cr. argentatus*, Chp.
p.p.	Head not strigose along middle.	
q.	Head densely strigose close to sides of and behind eyes . .	*Cr. mediocris*, n. sp.
q.q.	Head not strigose at sides of eyes.	

* In several species the third joint is slightly shorter than the fourth. Although *Cr. clarus*, n. sp., *Cr. appendiculatus*, n. sp., and *Id. nigripennis*, Baly, are placed here, they might fairly have been placed in the section having the third, fourth, and fifth joints of antennæ subequal.

r.	Scutellum obtusely rounded at apex	*Cr. dichrous*, Chp.
r.r.	Scutellum truncate at apex .	*Cr. conjugatus*, Chp.
M.M.	Base of scutellum more or less distinctly notched.*	
N.	Prothorax and elytra entirely dark.	
o.	Flanks of metasternum and of base of abdomen with dense golden pubescence	*Cr. aurifer*, n. sp.
o.o.	Under-surface without golden pubescence	*Lo. læviusculus*, n. sp.
N.N.	Prothorax more or less pallid.	
O.	Basal segments of abdomen with appendages in male .	*Cr. appendiculatus*, n. sp.
O.O.	Basal segments normal.	
P.	Prothorax with sharply-defined markings.	
q.	Markings longitudinal . . .	*Cr. eumolpus*, Chp.
q.q.	Markings transverse	*Cr. speciosus*, Boi.
P.P.	Prothorax without distinct markings.†	
q.	Elytra pallid and immaculate.	
r.	Upper-surface sanguineous red.	*Cr. hæmatodes*, Boi.
r.r.	Upper-surface testaceous . .	*Cr. terminalis*, Chp. (in [part.)
q.q.	Elytra pallid, but with darker markings.	
r.	Dark markings apical . . .	*Cr. terminalis*, Chp. (in [part.)
r.r.	Dark markings not apical . .	*Cr. gracilior*, Chp.
q.q.q.	Elytra dark, with pallid markings.	
r.	Markings lateral	*Id. pulchella*, Snd. (in
r.r.	Markings median.	[part.)
s.	Subhumeral lobes much above normal size‡.	*Id. flaviventris*, Snd.

* *Cr. terminalis*, Chp., is included here as the scutellum is really feebly notched, although from some directions it appears to be entire.

† In *Cr. cyanipennis*, Snd., and *Id. pulchella*, Snd., the prothorax in some specimens is stained in places with piceous, but there are no sharply-defined markings.

‡ It might have been considered that this character was worthy of being used for a more important division, but there are so many intermediate sizes that I have had to discard it as untrustworthy, and even now use it with hesitation.

s.s.	Subhumeral lobes of normal size.	
t.	Head densely strigose at sides of eyes	*Cr. clarus*, n. sp.
t.t.	Head punctate only	*Cr. chrysomelinus*, Chp.
q.q.q.q.	Elytra entirely dark.	[(in part.)
r.	Entire space between eyes densely punctate and strigose	*Cr. vicarius*, n. sp.
r.r.	Head punctate only	*Cr. chrysomelinus*, Chp.
r.r.r.	Head densely strigose at sides of eyes.	[(in part.)
s.	Prothoracic margins above normal width.	
t.	Head entirely pallid	*Id. nigripennis*, Baly.
t.t.	Head dark at base	*Cr. clarus*, n. sp. (in part.)
s.s.	Prothoracic margins of normal width*	*Id. pulchella*, Snd. (in [part.) *Id. cyanipennis*, Snd.
C.C.C.	Hinder apex of intercoxal process of prosternum rounded, or truncate, or more or less feebly produced in middle.†	
D.	Fifth joint of antennæ much wider than tenth.	
e.	Elytra without costæ . . .	*Cr. cœlestis*, n. sp.
e.e.	Elytra strongly costate . . .	*Cr. costipennis*, n. sp.
D.D.	Fifth joint of antennæ narrower than tenth, or at most just perceptibly wider.	
E.	Tenth joint of antennæ strongly transverse in both sexes . .	*Ca. histrionycus*, Chp.
E.E.	Tenth joint of antennæ at most feebly transverse in female, never in male.	
F.	Prothoracic margins crenulate.‡	

* These two species although bracketed together, are sufficiently distinct; see elsewhere for distinguishing features.

† In *Cr. tricolor*, Fab., *Cr. consors*, Boi., and *Lo. contiguus*, n. sp., the hinder apex is produced, rounded on the sides and truncate across middle; they would probably all have been referred to *Loxopleurus* by Chapuis.

‡ In some specimens of *Id. Tasmanica*, Snd., and *Pr. erudita*, Blackb., the margins are very distinctly crenulate, in others they appear to be almost entire.

g.	Scutellum shining and impunctate.	
h.	Prothorax pallid	*Cr. serenus*, n. sp.
h.h.	Prothorax black.	
i.	Elytra maculate	*Ca. litigiosus*, Boh.
i.i.	Elytra striped	*Ca. australis*, Boi.
g.g.	Scutellum coarsely punctate, at least on basal half.	
h.	Elytra smooth, without elevated interstices.	
i.	Tenth joint of antennæ in female slightly longer than wide	*Ca. excrementarius*, Suff.
i.i.	Tenth joint in female slightly transverse	*Ca. trispilus*, Chp.
h.h.	Elytra rough, the interstices more or less distinctly elevated.*	
i.	Second joint of antennæ more than half the length of third	*Id. tasmanica*, Snd.
i.i.	Second joint much less than half the length of third.	
j.	Apex of elytra much paler than disc	*Ca. purpurascens*, Chp.
j.j.	Apex not paler than disc.†	
k.	Prothorax with a more or less distinct dark U	*Pr. erudita*, Blackb.
k.k.	Prothorax without a dark U.	
l.	Fifth joint of antennæ just perceptibly longer than sixth .	*Ca. strigillatus*, Chp.
l.l.	Fifth joint very distinctly longer than sixth.	
m.	Elytra with four distinct transverse pallid fasciæ interrupted at suture	*Ca. quadrifasciatus*, n. sp.
m.m.	Elytra without four pallid fasciæ	*Ca. crucicollis*, Boi.

* In *Pr. erudita*, Blackb., the interstices although not elevated more or less throughout, as in most of the other species, are very distinctly elevated posteriorly.

† In these species the apex is usually paler than other parts of the elytra, but there are always parts of the disc equally pallid.

F.F. Prothoracic margins entire.*	
G. Elytra pubescent	*Ca. pacificus*, Suff.
G.G. Elytra glabrous.	
H. Scutellum fully twice as long as wide	*Lo. absonus*, n. sp.
H.H. Scutellum not twice as long as wide.	
I. Second joint of antennæ about as long as third	*Cr. pauperculus*, Germ.
I.I. Second joint distinctly shorter than third.	
J. Third joint of antennæ shorter than fourth.†	
k. Front of prosternum strongly raised and bent over backwards	*Ca. apicirufus*, n. sp.
k.k. Front of prosternum at most moderately elevated.	
l. Prothorax black	*Lo. graratus*, Chp.
l.l. Prothorax pallid with a transverse fascia	*Cr. T-viridis*, n. sp.
l.l.l. Prothorax pallid, except at extreme base.	
m. Elytra entirely black . . .	*Lo. mitificus*, n. sp.
m.m. Elytra pallid, with sutural and lateral markings	*Lo. fuscitarsis*, n. sp.
m.m.m. Elytra pallid without lateral markings, and the suture at most feebly infuscate . . .	*Lo. acentetus*, n. sp.
J.J. Third joint of antennæ longer than fourth.	
K. Third joint of antennæ longer than fifth.	

* In *Cr. rufoterminalis*, n. sp., *Cr. distortus*, n. sp., and in several other species to a less noticeable extent the prothoracic margins are suddenly constricted close to the apex so that the anterior angles project strongly outwards as in some species of *Schizosternus*, but the margins otherwise are entire. *Ca. stratioticus*, Chp., is referred here, as Chapuis describes the margin as "*integro*"; on close examination, however, of the specimen before me the margin is seen to be very feebly sinuous in places, but this would be overlooked except on a very close examination and from most directions. In most of the species the margins are feebly incurved in one or two places.

† In all of these species also the scutellum is either entire or just perceptibly notched.

l.	Terminal joints suddenly diminishing in size . . .	*Cr. rufoterminalis*, n. sp.
l.l.	Terminal joints not suddenly diminishing in size.	
m.	Elytra and appendages black .	*Lo. pollux*, n. sp.
m.m.	Elytra and appendages mostly reddish.	*Ca. T-niger*, n. sp.
K.K.	Third joint of antennæ at most as long as fifth and usually shorter.	
L.	Second joint of antennæ much less than half the length of third.*	
m.	Scutellum entire	*Ca. aurantiacus*, Chp.
m.m.	Scutellum notched at base.†	
n.	Antennæ distinctly longer than the body in both sexes.‡	
o.	Elytra fasciate	*Rh. sulphuripennis*, Baly.
o.o.	Elytra non-fasciate.	
p.	Punctures of upper-surface deeply stained	*Oc. vermicularis*, Snd.
p.p.	Punctures of upper-surface not at all or very feebly stained.	*Rh. antennatus*, Baly.
n.n.	Antennæ in female at most just passing apex of body.	
o.	Elytra with small and rather distant punctures§ . . .	*Cr. basizonis*, n. sp.
o.o.	Elytra more or less coarsely punctate.	
p.	Legs black.	
q.	Prothorax black, the margins whitish.	*Id. albilinea*, Snd.
q.q.	Prothorax reddish.	*Cr. jocosus*, Chp.

* In *Ca. scutatus*, Chp., *Ca. ornatus*, Chp., *Oc. apicalis*, Snd., and *Oc. rufescens*, Snd., the second joint is decidedly less than half the length of the third, being about one-third; in *Ca. calomeloides*, n. sp., *Lo. semicostatus*, Chp., and *Cr. Bynoei*, Snd., it is rather more than one-third, but decidedly less than half; in the others it is often but one-fourth or even less.

† In *Ca. sculptilis*, Chp., the scutellum is just perceptibly notched in some specimens and never very distinctly.

‡ I have included *Rh. sulphuripennis*, Baly, here, as Baly says "antennæ longer than the body in both sexes"; in my unique specimen both antennæ are broken.

§ To the naked eye the elytra appear to be impunctate.

p.p. Legs more or less red.	
q. Elytra with strongly elevated alternate interstices . . .	*Lo. semicostatus*, Chp.
q.q. Elytra with more or less regularly elevated interstices or punctate only.	
r. Scutellum coarsely punctate at sides.	*Oc. apicalis*, Snd.
r.r. Scutellum at most with a few small punctures.	
s. Scutellum strongly transverse.	
t. Elytra fasciate.	
u. Elytra with a complete basal fascia	*Cr. ornatipennis*, n. sp.
u.u. Elytra without a basal fascia .	*Ca. ornatus*, Chp.
t.t. Elytra non-fasciate.	
u. Prothorax coarsely and very densely punctate *	*Ca. stratioticus*, Chp.
u.u. Prothorax moderately densely punctate	*Ca. sculptilis*, Chp.
s.s. Scutellum feebly, or not at all transverse.	
t. Elytra with two black sharply-defined fasciæ †	*Id. hynoei*, Snd.
t.t. Elytra not at all or obscurely fasciate.	
u. Prothorax with very dense punctures, in places confluent.	
v. Prothorax and elytra with more or less distinct blackish markings	*Ca. scutatus*, Chp.
v.v. Prothorax and elytra without blackish markings	*Oc. rufescens*, Snd.
u.u. Prothorax with rather dense but clearly-defined punctures.	
v. Pygidium distinctly carinate .	*Ca. calomeloides*, n. sp.

* In *Ca. stratioticus*, Chp., the punctures are so close together that the surface is rendered opaque ; in *Ca. sculptilis*, Chp., the surface is shining and the larger punctures are distinctly separated, with the interspaces finely punctate.

† This species, however, has a variety without the fasciæ, but with two distinct postmedian spots.

v.v.	Pygidium not at all, or very indistinctly carinate.*	
w.	Size comparatively small (5 mm. or less)	*Oc. subfasciatus*, Snd.
w.w.	Size comparatively large ($6\frac{1}{2}$ mm.)	*Oc. australis*, Snd.
L.L.	Second joint about half the length of third.†	
M.	Scutellum coarsely punctate .	*Ca. perlatus*, n. sp.
M.M.	Scutellum at most with a few small punctures.	
N.	Scutellum entire.	
o.	Prothorax metallic green . .	*Lo. pallidipes*, n. sp.
o.o.	Prothorax entirely black.	
p.	Elytra entirely black. . . .	*Lo. atramentarius*, Chp.
p.p.	Elytra black with whitish sub-humeral lobes	*Lo. auriculatus*, Suff.
o.o.o.	Prothorax not entirely black.	
p.	Elytra blackish, the apex pallid	*Lo. erythrotis*, Chp.
p.p.	Elytra blackish, the sides only pallid.	
q.	Prothorax black (except at sides) in female	*Lo. microscopicus*, n. sp.
q.q.	Prothorax reddish in female .	*Lo. marginipennis*, n. sp.
p.p.p.	Elytra bright metallic green with pallid margins . . .	*Lo. lateriflavus*, n. sp.
p.p.p.p.	Elytra with pallid longitudinal discal markings.	
q.	Pale lateral margins not continuous	*Lo. inconstans*, n. sp.
q.q.	Pale margins continuous around apex	*Lo. castigatus*, n. sp.
p.p.p.p.p.	Elytra at most with basal and sutural markings.	
q.	Upper surface shining . . .	*Id. subbrunnea*, Snd.
q.q.	Upper surface opaque . . .	*Lo. immaturus*, n. sp.

* In *Oc. australis*, Snd., the base is feebly, the apex not at all carinate; in *Oc. subfasciatus*, Snd., there is often an obscure impunctate line (not at all or scarcely visibly elevated) that from some directions appears like a feeble carina.

† It is frequent more than half the length of the third, rarely it is not quite half.

N.N. Scutellum notched at base.*
O. Scutellum strongly transverse, its apex truncate.
p. Elytra pallid . . . . . *Cr. rutilans*, n. sp.
p.p. Elytra green or blue . . . . *Cr. consors*, Boi.
p.p.p. Elytra reddish with two black conjoined fasciæ . . . . *Cr. comptus*, n. sp.
O.O. Scutellum as long as wide or longer, if transverse then more or less triangular.
P. Prothorax and elytra entirely black . . . . . *Id. atra*, Snd.
P.P. Prothorax and elytra not both black.
Q. Scutellum much longer than wide . . . . . *Lo. obtusus*, Chp.
Q.Q. Scutellum at most just perceptibly longer than wide.
R. Upper-surface not at all red.
s. Elytra densely punctate, the punctures frequently confluent . . . . . *Ch. viridis*, Snd.
s.s. Elytra moderately punctate, the punctures seldom confluent . . . . . *Lo. subvirens*, Chp.
R.R. Prothorax or elytra more or less red.
S. Elytra not at all red.†
t. Elytra bright metallic green or blue . . . . . *Cr. tricolor*, Fab.
t.t. Elytra deep, pure black.
u. Prothorax almost entirely black . . . . . *Lo. dolens*, n. sp.
u.u. Prothorax red.
v. Four front femora black . . *Lo. castor*, n. sp.
v.v. Four front femora reddish . . *Lo. conjugatus*, Chp.
t.t.t. Elytra, if black, with a purplish-bluish or greenish gloss.

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* In *Lo. subvirens*, Chp., and *Lo. gravatus*, Chp., the scutellum is just perceptibly notched; in *Lo. piceitarsis*, Chp., the notch is occasionally fairly distinct, but it is usually traceable with difficulty.

† In the male of *Lo. piceitarsis*, Chp., however, the apex is sometimes feebly diluted with red.

u.	Head densely, coarsely and regularly punctate. . . .	*Lo. mixtus*, n. sp. ♂.
u.u.	Head differently sculptured.*	
v.	Intercoxal process of prosternum with a distinct (although short) median process.	*Lo. disconiger*, n. sp. ♂.
v.v.	Intercoxal process obtusely rounded.	
w.	Prothorax reddish in both sexes	*Lo. piceitarsis*, Chp.
w.w.	Prothorax black, or blackish in male	*Lo. lugubris*, n. sp.
S.S.	Elytra more or less red.	
T.	Middle of apex of prothorax black†.	*Lo. disconiger*, n. sp. ♀.
T.T.	Middle of extreme apex of prothorax not black.	
U.	Elytra without dark markings or only at base and suture.	
v.	Prothorax fasciate.	*Cu. fasciaticollis*, n. sp.
v.v.	Prothorax non-fasciate . . .	*Lo. mixtus*, n. sp. ♀.
U.U.	Elytra with dark markings other than at base and suture.	
V.	Markings transverse	*Cr. minusculus*, n. sp.
V.V.	Markings longitudinal.	
W.	Prothorax without discal markings	*Lo. virgatus*, n. sp.
W.W.	Prothorax with discal markings	*Lo. contiguus*, n. sp.

Lachnabothra braccata, Klug.

Lachnabothra Hopei, Saund.

var. *Lachnabothra Breweri*, Baly.

Dr. Baly says of this insect (described as a *Chlamys* with a query by Klug): "I have not been able satisfactorily to identify Dr. Klug's insect; it is, however, very closely allied to *L. waterhousei*, and may possibly prove to be the same

* In these species the head has sometimes fairly large punctures, but then the interspaces are densely punctate or strigose.

† The black portion extends to the extreme apex.

insect." Klug describes the prothoracic tubercles as "parum elevatis," whilst in *Waterhousei* they are as described by Baly himself "validum subconicum." In the figure by Klug the tarsi are drawn of normal appearance. The species to my thinking is undoubtedly *L. hopei*, of which the male was unknown to Saunders. *L. breweri* appears to be only a slight variety of this species.

LACHNABOTHRA SAUNDERSI, Baly.

(Plates XXV, XXVI, figs. 178, 180, 181.)

The exact locality of his specimens was unknown to Baly. I have specimens agreeing with his description from Sydney, Wollongong and Queanbeyan (N. S. Wales). Two males from Tasmania have the base of the elytra and the greater portion of the prothorax stained with black.

LACHNABOTHRA WATERHOUSEI, Baly.

Hab. N. S. WALES: Forest Reefs.

LACHNABOTHRA WILSONI, Baly.

Hab. S. AUSTRALIA,

PRASONOTUS SUBMETALLICUS, Suff.

Prasonotus morbillosus, Baly.
„ *morbillosus*, Chp.
„ *chapuisi*, Blackb.

(Plate XXIV, fig. 106.)

I believe that *morbillosus*, Baly, and *morbillosus*, Chp., both belong to this species. I have taken a considerable number of specimens in Western Australia, all on *Xanthorrhœæ*. The specimens which I refer to the species vary to a remarkable degree in the sculpture of prothorax and elytra; on some small specimens the prothorax is punctate only, except for a few strigosities at the outer base; in others the strigosities extend round the sides and front, whilst in some large specimens the sculpture agrees exactly with Baly's descriptions of those of *morbillosus*. On the small specimens the elytra are regularly seriate-punctate, or regularly striate-punctate, except close to the shoulders: in the larger ones the punctures are not only much larger, but very much more irregular, but close to the suture apex and outer margins (except close to the

shoulders) they are in almost regular rows, the interspaces between the rows at the places named being almost regularly convex (in the small specimens the elytra are striate only at the apex).

I have not seen the variety described by Baly as having the head and prothorax black, but a rather common variety in Western Australia has a large black cloud on the disc of the prothorax and nearer the base than apex. The elytra vary from deep blue to deep green.

Suffrian's and Chapuis' specimens were from W. Australia, Baly's from N. S. Wales and W. Australia. If I am correct (as I think I am) in referring both Baly's and Chapuis' species to *submetallicus* there will be no necessity for the name *Chapuisi* proposed by Blackburn * for *morbillosus*, Chp.

Prasonotus ruficandis, Baly.

Hab. N. S. Wales.

Cadmus rugicollis, Gray.

(Plate XXII, figs. 1, 2.)

I have seen many specimens agreeing with Saunders' description of this species, which appears in the catalogue as a synonym of *rubiginosus*, Boi.; as to which species are really *rubiginosus*, Boi., and *gigas*, Oliv., probably only an examination of the types (if such are still extant) could determine. The description and figure of *rugicollis* as given in Cuvier's "Animal Kingdom" (vol. 15, p. 146, and plate 67, fig. 5) are quite useless.

Hab. Queensland: Wide Bay; N. S. Wales: Hunter River; Sydney; Victoria: Gippsland; S. Australia.

Mr. A. Simson has two males from Queensland, which I hesitate to regard as representing more than a variety of this species; they are considerably narrower than Tasmanian specimens, and the elytral markings are somewhat different; but as I have seen forms from N. S. Wales intermediate in width I have not thought it advisable to describe them as new.

Cadmus litigiosus, Boh.

The size of the spots on this species vary to a certain extent, and a specimen in the Macleay Museum has the two hind spots conjoined.

* T. R. S. S. A., 1891, p. 139.

Hab. N. S. Wales: Monaro, Queanbeyan, Jenolan; Victoria: Gisborne.

Cadmus australis, Boi.

Hab. Tasmania (widely distributed).

Cadmus excrementarius, Suff.

(Plate XXII, fig. 3.)

Hab. N. S. Wales; S. Australia; W. Australia.

Cadmus pacificus, Suff.

The specimen described by Suffrian was a typical female, and of which I have seen numerous specimens. I have a female which is dark red except that the head, terminal joint of antennæ, two transverse spots on prothorax (separated at the median line), base of prothorax, scutellum and elytra, and a small spot on each shoulder, are black, the metasternum is infuscate. Another female has in addition the two terminal joints of tarsi, the whole of the scutellum and several obscure patches on elytra, black; this specimen agrees passably well with Chapuis' description of the female of *strigillatus*, but probably his female was different. One female before me is entirely black, except for its pubescence and some obscure antennal joints.

The male is always smaller than the female ($3\frac{1}{2}$–$4\frac{1}{4}$ as against $4\frac{3}{4}$–6 mm.) and the antennæ are considerably longer (noticeably passing the apex of the body). The normal male is black except for the 2nd, 3rd and 4th, part of the 5th and the lower portion of the 1st joints of antennæ and the connection between femora and coxæ; the apex of the elytra has usually an indistinct reddish spot or margin, never so distinct or wide as in the female and occasionally quite absent. A form of the male occurs in which only the upper surface of the 1st and the apical three-fourths of the 11th joints of antennæ are black. One male before me has the upper portion of the 1st and the whole of the 11th joints black on both sides; the left antenna has the 6th and 7th joints dark, whilst the right has the apex of the 5th and the whole of the following joints dark.

Suffrian says the prothorax of this species has serrated margins. I have never seen a specimen in which the

margins are truly serrated, although owing to the clothing they frequently appear to be so.

The species is very common on young Eucalyptus foliage, and I have taken many pairs *in copula*.

Hab. Tasmania : Hobart, Huon River, Frankford, Ulverstone, Sheffield, Mt. Wellington ; N. S. Wales : Mt. Victoria, Sydney, Goulburn.

Cadmus purpurascens, Chp.

A female from Ropes Creek in the Macleay Museum agrees exactly with Chapuis' description and figure of this species ; a male in my own collection from Jenolan, which I believe to be conspecific, has the base of the head, the space between the antennæ and a line connecting with the base black, the head elsewhere being flavous ; the antennæ are entirely black except the lower parts of the four basal joints ; the prothorax is piceous-brown with obscure darker spaces and with the lateral and anterior margins flavous ; the scutellum is black, the elytra are as in the female except that the shoulders, two small and obscure submedian spots (the outer one almost exactly in the middle of the length, the inner somewhat nearer apex) and the extreme margins are black ; the femora and tibiæ are black variegated with flavous, the tarsi are entirely black.

Chapuis does not mention the length of the antennæ ; in the male before me they considerably pass the apex of the body, in the female they just extend to the apex.

Cadmus stratioticus, Chp.

There is a specimen of this species in the Macleay Museum, but it is without a locality label.

Cadmus sculptilis, Chp.

A very pretty species the type of which was described as having a brown scutellum ; in seven specimens before me only two have it brown (a male and a female), in the others it is of a deep black ; the elytral punctures are also described as brown, in two male specimens they are deep black ; in one male the entire legs are pallid. There is in all seven a black spot on each shoulder, but the spots are sometimes very small. The smallest male measures $4\frac{3}{4}$, the largest female 7 mm.

Hab. Queensland; N. S. Wales; Victoria; South Australia.

Cadmus scutatus, Chp.

(Plate XXIV, fig. 107.)

This species, of which only the female was known to Chapuis, is very variable and is fairly common about the Swan River; I have but one specimen (a female), however, which agrees exactly with Chapuis' description. In the other specimens the scutellum is entirely black, or black with the apex reddish.

In the ordinary female a line down the face, a median prothoracic line (both rarely absent) and occasionally an indistinct spot on each side are black; on the elytra the humeral calli are always darker than their surroundings, and there are often more or less distinct traces of two dark fasciæ (one subbasal, the other median); the basal joint of antennæ is usually black above, the apical joint is usually infuscate or black, sometimes the two apical joints are black; occasionally the entire antennæ are pallid.

The ordinary male has the two apical joints of the antennæ and most of the basal, the vertex and a line down the face, a prothoracic cross, the humeral calli and traces of two fasciæ (as in the female) and the greater part of the metasternum black (one female under examination agrees in all respects with such markings). The prothoracic cross is much as in the ordinary form of *crucicollis*, but more sharply defined; from *crucicollis*, however, the species may be distinguished by the very different elytral sculpture.

Cadmus histrionicus, Chp.

(Plate XXII, fig. 4.)

The exact locality of his specimen (a female) was unknown to Chapuis; the species was subsequently referred by Baly to *Prionopleura*.

I have a pair taken *in copula* at Geraldton (Champion Bay) in which the male agrees with Chapuis' description; two females from Birchip (Victoria) and one from South Australia also agree with the description; the Geraldton female, however, differs in having only the two terminal joints black.

The black markings of the under-surface and the elytral spots are subject to considerable variation, but the

species, on account of its antennæ, is one of the most distinct in the subfamily.

Cadmus luctuosus, Chp.

Paracadmus lucifugus, Baly.
Cadmus maculicollis, Chp.

(Plates XXII, XXIV, figs. 5, 6, 7, 108, 109, 110.)

I concur with the Rev. T. Blackburn (T. R. S. S. A., 1890, p. 135) in regarding *Paracadmus lucifugus* as a synonym of this species. A specimen before me has the extreme base of the front femora pallid beneath as well as the four hind ones; in three males one has a dark streak on the 2nd and 3rd ventral segments (as in *lucifugus*), one has a streak on the 1st, 2nd, and 3rd and one on the 2nd, 3rd and 4th; in one the pale markings on the prothorax are as described by Blackburn, in another the discal markings are entirely absent, whilst in another they are represented by two small feeble spots.

The female of this species has been described under the name of *maculicollis* by Chapuis, and I have both the typical form and variety described by him.

For the mating of these very dissimilar sexes I am indebted to Mr. Masters, who has taken specimens *in copula*.

Hab. N. S. Wales: Mounts Kosciusko and Victoria, Sydney, Bombala, Cooma and Jenolan.

Cadmus ornatus, Chp.

(Plate XXII, figs. 8, 9.)

Three specimens from Ipswich, Moreton Bay and Brisbane agree with Chapuis' description of this species, another from Ipswich differs in having the greater portion of the prothorax clouded with black and the fascia reduced to a rather narrow spot on the middle of each elytron.

Two females (in the Macleay Museum) from Rockhampton appear to represent a very distinct variety, having the head, anterior and lateral margins of prothorax, the raised portions at base of elytra, a rather wide median fascia and the apex pale flavous.

Two males (also in the Macleay Museum) from Ipswich have the elytra reddish-brown throughout except for a

very narrow black basal edging; the vertex and a line down the face are brown, and there is a large inverted infuscate triangle on the prothorax; the prothoracic margins, however, are flavous, as in all the other specimens.

All these specimens agree so well in their structural details that I have no option but to regard them as varieties of one species although the colour differences (especially of the last described specimens) are so pronounced.

Cadmus quadrivittatus, Chp.

(Plates XXII, XXIV, figs. 10, 111.)

Only the male was known to Chapuis. The female differs in being larger (7½ mm.) with shorter and almost uniformly coloured antennæ, markings on both head and prothorax of a dingy brown instead of black and dark markings quite absent on the elytra under-surface and legs; in both sexes of the specimens before me the two median prothoracic markings are conjoined at the base.

Hab. Queensland: Gayndah.

Cadmus strigillatus, Chp.

A female from Canterbury (N. S. Wales) differs from the male (of which I have Victorian specimens before me) in having only the basal markings of elytra ("*callo humerali, fascia submedia obliqua*") distinct, the apical spots being scarcely traceable. Chapuis describes the prothorax of the female as "*brunneo, macula transversa notato.*" In my female the prothorax is black with the anterior and lateral margins obscurely pallid; its antennæ, however, are as in the type female.

Cadmus trispilus, Chp.

(Plate XXII, fig. 11.)

This species is very closely allied to *exercmentarius*, Suff., differing principally in length and width of antennæ. One specimen before me has a large space at the base of the elytra black and also a broad irregular sutural stripe to beyond the middle of the same colour.

Hab. Queensland: Brisbane, Wide Bay, Rockhampton; N. S. Wales: Inverell.

Cadmus aurantiacus, Chp.

(Plate XXIV, figs. 112, 113, 114, 115.)

I have three specimens from Jenolan (where the species appears to be common) which agree with the description of this species except in having the vertex and between the eyes black. The size and density of the prothoracic punctures vary greatly in the species; the elytra vary in colour from dark brownish-red to almost flavous.

Var. A.—Prothoracic markings reduced to five small disconnected spots.

Var. B.—Metasternum, abdomen (except intercoxal process), scutellum, part of 1st and the 6th–11th antennal joints, apex of femora and of tibiæ and the tarsi black; prothoracic Y broken up into three (two large and one rather small) disconnected spots.

Var. C.—Metasternum, abdomen (except intercoxal process), scutellum, antennæ (except the 2nd, 4th and part of the 1st joints), apical half of femora and of tibiæ and the 1st and 3rd tarsal joints, black.

All the specimens I have seen are females; the male is probably very different in appearance and possibly already bears another name.

Cadmus colossus, Chp.

Referred by Chapuis to *Cadmus*, by Baly to *Brachycaulus*, to which it really belongs. The male of this species appears to be very rare; judging by the only specimen I have seen it differs from the female in being smaller (7 mm.) and darker and with the antennæ longer and thinner; the elytra also are considerably rougher.

Hab. Queensland: Brisbane, Dawson River, Wide Bay, Port Denison; N. S. Wales: Condobolin.

Cryptocephalus (Cadmus) pauperculus, Germ.

(Plate XXII, figs. 12, 13, 14.)

This is a very variable species and rather common about Sydney. The male is fairly constant in size, but varies from the form described by Germar to one in which the prothorax is almost entirely pale with the elytral markings consisting of a dark basal patch and four (feebly connected

or not) post-median spots; in all the paler varieties the pygidium and apical segment of abdomen are pallid; a male before me has the prothorax, abdomen and pygidium black, but the elytra as in the type. A common variety of the male is entirely piceous black with the legs and antennæ in parts paler; rarely the whole insect is dark.

The female rarely resembles the type in colour and varies from 2 (vix) to $2\frac{1}{2}$ mm.; the normal form is pallid except for the head, terminal joints of antennæ, scutellum, and the base of both prothorax and elytra, and usually (but not always) a small post-median spot on each elytron. In a female in the Macleay Museum the prothorax is clouded in front (except at the extreme apex); the scutellum and a rather wide space at base of elytra, the suture and four post-median spots are dark.

Cryptocephalus tricolor, Fab.

(Plate XXV, fig. 156.)

I have before me the sexes (four males and three females) of a species which I believe to be *tricolor*. Fabricius' description is brief enough, but he describes the abdomen as "*albidum*." Commenting on the species Suffrian remarks: —"I do not know this species, the one which I consider closest to the description is *viridipennis*, Saund." It appears to me that *viridipennis*, Saund. (*perlongus*, Chp.), cannot possibly be *tricolor*, which is described as "*parvus*," whilst *viridipennis* is a large species; its abdominal clothing is certainly whitish, but it is sparse and indistinct. It is also very unlikely that Fabricius would have described as a variety of *tricolor* a species which has been referred to *consors*, had *tricolor* been at all like *viridipennis*.* The species I believe to be *tricolor* is small and has the abdomen very pale flavous (in two females it might fairly be called dingy white), its prothoracic margins are rather wide, the scutellum is flat, impunctate, triangular (but truncate at tip) and notched at base; the tarsi are blackish. The male is smaller than the female (male $2\frac{3}{4}$, female $3\frac{1}{4}$ mm.) and has longer antennæ: in two males the elytra are blue, in the other male, and in all the females they are coppery-green.

* And if the type is a male it could not possibly be *viridipennis*.

The species is allied to *consors* but is smaller, the prothorax immaculate and with wider margins, the under-surface and legs (except tarsi) pallid, and the scutellum longer and with the basal notch more distinct. In *consors* and its varieties the punctures on the head (although somewhat variable individually) are simple; in *tricolor* they are very dense (especially on the black portion), more or less confluent and with the interstices strigose.

Hab. Tasmania: Huon River (on young Eucalyptus leaves).

Cryptocephalus scabrosus, Oliv.

Idiocephala rugosa, Saund.
var. *Idiocephala similis*, Saund.
var. *Cryptocephalus rugifrons*, Chp.
var. „ *eximius*, Chp.

Re-described by Saunders as *Idiocephala rugosa*, as noted in Masters' catalogue; Saunders regarded the red apex of elytra and golden pubescence of under-surface as sufficient to distinguish it from his *similis*, but I can only regard them as forms of one species. I have before me a female in which there is the typical red patch of *scabrosus*, whilst a male (taken *in cop.* with it by Mr. Masters) has the red patch just traceable, being very small in extent and much darker than usual. In a pair of *similis* before me the pubescence of the under-surface is golden in the female and silvery in the male. A male specimen of *similis* has a distinct greenish gloss on the whole of the upper surface.

Similis appears to be the typical form, and *scabrosus* the variety. In both the sculpture of prothorax and elytra varies considerably; they are fairly common in N. S. Wales.

Rugifrons, Chp., from S. Australia and *eximius*, Chp. (omitted from the catalogue), I can only regard as very slight local varieties.

Cryptocephalus jacksoni, Guer.

Originally described from Sydney, but a common species in early summer in N. S. Wales, Victoria, S. Australia and Tasmania; the sexes are alike in colour. A variety, fairly common in Tasmania, is of a deep purple colour, but occasionally the purple is confined to the elytra.

Cryptocephalus salebrosus, Guer.

As this species is compared with *Cadmus rugicollis*, it is probably allied to that species; * but the description is too imperfect to render its identification at all certain.

Cryptocephalus hæmatodes, Boi.

var. *Cryptocephalus carnifex*, Suff.

Re-described by Saunders (to whom only the female was known) as a *Diecnopsis*. In the ordinary female of this species the under-surface is dark red stained in places with piceous; in the ordinary male the whole of the under-surface, except the flanks of the prosternum, is black; in both sexes the tibiæ (except at base and apex) are blood-red, in the female the femora are usually red stained in places with black, in the male the femora (except the base of the anterior pair) are usually deep black. In the female the pygidium is red, in the male it is sometimes red and sometimes black; the head is red in the female and more or less black in the male.

C. carnifex, Suff., differs in having the under-surface and legs in both sexes entirely black (with or without a bluish gloss) and the punctures of both prothorax and elytra very much smaller and sparser. I believe, however, that it should be regarded as a (very distinct) variety of *hæmatodes*, although it is smooth whilst *hæmatodes* is rough; the antennæ of both forms are identical (those of the male being unusually long and those of the female unusually short) and the punctures are similar in character (although very much coarser in *hæmatodes*, but very variable amongst individuals), being, on the elytra, crowded at the base, subgeminate in arrangement about the middle and seriate posteriorly; in *carnifex* the elytra are feebly or not at all striate posteriorly, in *hæmatodes* they are feebly or moderately strongly striate posteriorly; the posthumeral lobes and the scutellum (frequently useful distinguishing features) are identical in both.

I have only seen specimens of *hæmatodes* from Tasmania and of *carnifex* from the mainland—S. Australia; Victoria —Benalla, Mangalore and Korumburra; N. S. Wales—Forest Reefs, Bombala, Sydney and Queanbeyan.

* Quite possibly it is a variety of it, as the distinguishing features relied on related to colour only.

Cryptocephalus crucicollis, Boi.

Cadmus crucicollis (Boi.), Suffr.
Prionopleura crucicolle (Boi.), Saund.
var. *Prionopleura hopei*, Saund.
„ „ *creek-nigra*, Saund.
„ „ *flavocincta*, Saund.
„ *Cadmus cinnamomeus*, Suffr.
„ „ *amplicollis*, Chp.

(Plates XXII, XXIV, figs. 15, 16, 17, 18, 19, 20, 116, 117, 118, 119.)

This is probably the most widely distributed and at the same time the most variable species in the subfamily. I have specimens from all the Australian States. Not only are the colours and markings very variable, but the sculpture of the elytra is much less acute in some specimens (especially in the varieties about *flavocinctus*) than in others; the prothorax also seems to overhang the head more in *flavocinctus* and *amplicollis* than in the more typical forms.

On Mt. Kosciusko and in Tasmania a variety occurs which is entirely black except that parts of the coxæ and some of the antennal joints are obscurely diluted with red. In specimens having the ordinary markings the black terminal joints of the antennæ vary in number from one to seven.

A small male from Brisbane agrees exactly with Chapuis' description of *amplicollis* (a variety close to *flavocinctus*); a female received with it has the prothoracic cross reduced to a longitudinal and two transverse disconnected vittæ.

Of *cinnamomeus* Blackburn says (T. R. S. S. A., 1890, p. 136): "I have never seen a specimen quite agreeing with Suffrian's type, which should have no markings at all on the prothorax." I have a pair taken near Sydney *in cop.*, of which the female has the prothorax entirely without markings and agreeing with Suffrian's description of *cinnamomeus*, and the male with the markings ascribed by Saunders to *flavocinctus*.

I have not considered it necessary to give any fresh varietal names, although the black specimens from Mt. Kosciusko and Tasmania are much more distinct from the typical form than any of the already named varieties.

Cryptocephalus consors, Boi.

Cryptocephalus tricolor, Fab. var.
var. *Idiocephala roci*, Saund.
„ „ *atripennis*, Saund,
„ „ *elegans*, Saund.
Loxopleurus plagicollis, Chp.

(Plate XXV, figs. 136, 137, 157.)

In this species and its varieties the dark parts of the head and prothorax vary considerably in extent independently of sex, and specimens from Tasmania as a rule are larger and darker and the markings greater in extent than on those from N. S. Wales.

The form described by Boisduval was without the yellow elytral margins and appears to be rare; Blackburn (T. R. S. S. A., 1891, p. 139) records it from N. S. Wales.

Cryptocephalus tricolor, Fab. var. Suffrian (Linn. Ent., 1859, p. 101) says the supposed variety of *tricolor* described by Fabricius belongs to *consors*.

Idiocephala roci, Saund. This is the common form, having, as described by Saunders, the yellow margins not continuous to the apex of elytra, the scutellum black and the femora black except at base. It was described originally as from the Swan River and Van Diemen's Land, and is fairly common in N. S. Wales, Victoria and Tasmania.

I. atripennis, Saund. A variety having the elytra black and 3rd and 4th joints of antennæ brownish; it is apparently a very rare variety and is unknown to me; no locality for it is given by Saunders.

I. elegans, Saund. Described as having the scutellum and femora pale and the external markings of elytra almost continuous to apex. In a pair taken *in cop.* near Sydney the male has the scutellum black and the female pale but with dusky margins.

Loxopleurus plagicollis, Chp. This appears to be a synonym only of the variety *elegans*.

A variety, hitherto undescribed, of which I have a specimen from Sydney, has the scutellum and femora pale, the lateral markings of elytra very narrow towards but conjoined at apex, and the prothoracic blotch reduced to a narrow brownish streak; the 3rd and 4th joints of its antennæ are paler than the others.

Another variety from N. S. Wales differs from variety *roei* only by having the base and apex of femora pallid.

Still another variety from N. S. Wales has the scutellum black, femora pallid and pale elytral margin conjoined at apex, with the three basal joints diluted with red.

Dr. Baly refers the species to his genus *Euphyma*.

Cryptocephalus speciosus, Boi.

(Plates XXII, XXV, figs. 21, 138.)

A common species and one of the very few Australian members of the genus in which the markings do not appear to vary.

Hab. N. S. Wales: Tamworth; Queensland: Brisbane, Somerset, Townsville, Moreton Bay.

Cryptocephalus castus, Suff.

(Plate XXII, figs. 22, 23.)

This is a fairly common species with slightly variable markings.

Hab. W. Australia; S. Australia.

Cryptocephalus parentheticus, Suff.

(Plates XXII, XXIV, figs. 24, 25, 26, 27, 120, 121.)

This is a very variable species. The prothoracic markings consist of three longitudinal black bands of very variable size and occasionally conjoined. The dark parts of the elytra may cover the greater part of their surface or a small portion only. In some Brisbane specimens the dark elytral markings consist of a narrow semicircular basal edging commencing on the shoulders and conjoined behind scutellum, a narrow sutural edging and a rather small oblong spot near the apex of each elytron; in a specimen from Rockhampton the colour is as in these except that the apical spot is wanting, in others from Brisbane the apical spot is semi-connected with the suture by a series of small spots. The under-surface and appendages appear to be constant in coloration.

Hab. S. Australia; Victoria; N. S. Wales: Sydney, Goulburn, Forest Reefs, Windsor, Ropes Creek, Hay; Queensland: Brisbane, Rockhampton, Ipswich.

Cryptocephalus viridinitens, Chp.

A beautiful species in colour resembling *jacksoni* * but in sculpture approaching *scabrosus*; the narrow but distinct carina on the pygidium should alone render it distinct.

A male specimen (kindly presented to me by Mr. H. J. Carter) has the prothorax and elytra of a beautiful golden-purple, the base of the head and scutellum coppery or coppery-green, the head in front, pygidium and the lower surface green, the legs blue with purplish reflections and the antennæ black with, in places, a bluish gloss. In size it is smaller than the female with the eyes closer together and the antennæ longer than the body (in the female the antennæ barely extend to the pygidium).

Hab. N. S. Wales: Sydney, Blue Mountains; Victoria: Warragul.

Cryptocephalus eumolpus, Chp.

(Plates XXII, XXV, figs. 28, 29, 145.)

I have seen typical specimens of this species from Mackay, Port Denison and Somerset. A variety from Somerset differs in having the prothoracic marking reduced to a narrow streak, the scutellum and elytra very narrowly bordered with black, and the only spot on each elytron the humeral one and this is deep black, without the least bluish or purplish gloss.

Cryptocephalus clavicornis, Chp.

(Plate XXVI, figs. 183, 184.)

Mr. Masters has given me under this name a pair of insects from the Clarence River which differ from Chapuis' description in having the head rather coarsely punctate and the tibiæ of the male entirely black. I believe, however, that they are correctly named, as the antennæ are peculiar and exactly as described.

Cryptocephalus bihamatus, Chp.

(Plates XXII, XXV, XXVI, figs. 30, 139, 140, 141, 142, 158, 185, 186.)

An unmistakable species, at least as regards the male. A remarkable character of the male, not mentioned by

* In several collections I have seen specimens of *jacksoni* bearing the name *viridinitens*.

Chapuis, is that the serrations of the antennæ are reversed after the 7th joint.

The male has usually on the prothorax a large subtriangular black median patch (the narrow end touching the base); in the female the patch is sometimes widest in the middle and broad at the base, the part in front being reduced to a point, or frequently it appears as a narrow streak. The dark fasciæ on the elytra are deep black and sharply defined in the male; in the female they are much less sharply defined and are occasionally absent. In two females under examination the abdomen and legs (except the penultimate joint of all the tarsi) are entirely pallid.

Hab. VICTORIA; N. S. WALES: Jenolan, Tamworth, Whitton, Ropes Creek, Yass, Armidale, Blue Mts.; QUEENSLAND: Brisbane, Port Denison.

CRYPTOCEPHALUS PŒCILODERMIS, Chp.

A pretty and somewhat variable species. A female from Somerset, measuring 8 mm., has the metasternum slightly infuscate and the punctures surrounding the scutellum stained with black instead of brown. The prothorax, elytra and scutellum are narrowly edged with black or dark brown (a character not mentioned by Chapuis).

Specimens in the Macleay Museum from N. W. Australia are smaller (♂ 5¼, ♀ 6½ mm.) and paler than those from Queensland, and the punctures on both prothorax and elytra are smaller.

Two males before me have the fifth abdominal segment unusually large, and with a wide and not very shallow excavation occupying the greater portion of its surface, this excavation is of a totally different character to the apical fovea of the female, and is not bordered with hairs. Seen from above the excavated segment appears to be the fourth, but the fourth is visible only from the sides, each side of it appearing as an isosceles triangle.

A female measuring 8 mm. from Port Darwin (in the Macleay Museum) I hesitate to regard as more than a variety of this species; it differs, however, from a female from Port Denison (the original locality) in having the vertex infuscate and with larger and in places confluent punctures, the prothoracic punctures larger and not stained, the elytral punctures larger and more deeply stained, the stains more confluent and the pallid spaces more longitudinal and maze-like in appearance, not, as in the type,

"elytris subbifasciatis, punctis pone basin et pone medium congestis," the scutellum notch is also larger. It would be unsafe, however, to describe it as a new species without seeing more specimens.

Cryptocephalus terminalis, Chp.

? *Cryptocephalus facialis*, Chp.

(Plate XXII, fig. 31.)

The type specimen of this species (undoubtedly a female) had a large apical black patch. I have seen three such females, but four others have the elytra (except at the extreme base) entirely pallid; five males (one marked as having been taken *in cop.* with a Gayndah female having the dark apical patch) have the elytra also of uniform colour. It is doubtful therefore as to whether the form of the female having the black apical patch should be regarded as typical or varietal, but the typical male at least appears to be without the apical patch. Specimens vary considerably in the size of their punctures.

The male differs from the female in being smaller and with longer and thinner antennæ. It seems to me quite possible that the male was described by Chapuis under the name of *facialis*; he says, however, that the antennæ of that species have only the basal joint red and that the tarsi have the two apical joints infuscate, whilst in all the males of *terminalis* before me the two basal joints of antennæ (and usually part of the third) are pallid and *all* the tarsal joints are dark.

This species is perilously close to *C. conjugatus* (not *Loxopleurus conjugatus*, Chp.), but even if it is to be regarded as a variety of that species it can be readily distinguished by its pallid under-surface and legs (except tarsi).

Hab. Queensland: Gayndah, Port Denison, Mackay; N. W. Australia.

Cryptocephalus antennalis, Chp.

Dr. Chapuis says of this species "*capite rugulosa, postice subtuberculate.*" There are two specimens from Wide Bay (the original locality) in the Macleay Museum which I refer, without hesitation, to this species, but I cannot regard the base of the head as subtuberculate, the base is rather more convex than is usual in the genus, but the

outline of the convexity is uniform. The head is densely and finely longitudinally strigose with rather numerous punctures at the sides.

Cryptocephalus conjugatus, Chp.

Specimens from N. W. Australia in the Macleay Museum agree in colour, size, etc. with some from Port Denison (the original locality), but differ in having the punctures of the upper surface (and especially of the elytra) finer.

Two specimens from Somerset have the punctures (especially of the elytra) noticeably coarser than the Port Denison ones, whilst one of them has the femora and four basal joints of antennæ (instead of five) pallid.

This species (probably on account of there being a *Loxopleurus conjugatus*) was omitted from the catalogue.

Cryptocephalus gracilior, Chp.

(Plate XXII, fig. 32.)

Of this species Chapuis says, "*elytris . . . basi late . . . nigro-cyaneis.*" I have seen numerous specimens from Queensland (Somerset, Townsville, Mackay, Duaringa and Port Denison), which probably belong to it and in which the basal marking is advanced along the suture and shoulders, the dark part of the head has a bluish gloss (Chapuis simply says "*nigra*"), and the abdomen varies from flavous to wholly black. Chapuis describes the prothorax as having an abbreviated black line; such a line appears to be usually present, but it is occasionally absent, whilst in one specimen under examination there are three feeble lines to be seen.

Cryptocephalus chrysomelinus, Chp.

(Plates XXII, XXV, figs. 33, 159.)

The male (unknown to Chapuis) differs from the female in being smaller, with less parallel and smaller elytra and antennæ longer than the body, those of the female being noticeably shorter. I have a specimen from Somerset and have seen others from Townsville.

A variety from Somerset has on each elytron a fairly large oblique flavous spot before the middle and conjoined at suture, the shape and position being much the same as

in *flaviventris* but rather smaller; the other parts of the elytra are metallic, varying from green and blue to various shades of gold and purple.

Hab. QUEENSLAND: Port Denison, Endeavour River, Cairns; N. W. AUSTRALIA.

CRYPTOCEPHALUS JOCOSUS, Chp.

Loxopleurus postremus, Chp.
Rhombosternus pretiosus, Baly.

(Plate XXII, figs. 34, 35.)

The female of this species, of which I have taken many pairs *in cop.*, was described by Chapuis in 1875 as coming from Victoria, the male was subsequently described (also as from Victoria) by him as *Loxopleurus postremus*. In 1877 Baly described the female as *Rhombosternus pretiosus*. In both sexes the head varies from entirely red to half red and half black.

Hab. N. S. WALES: Armidale, Forest Reefs, Queanbeyan, Blue Mts., Jenolan; VICTORIA: Gisborne.

CRYPTOCEPHALUS IRIDIPENNIS, Chp.

var. *Idiocephala chapuisi*, Baly.

(Plate XXII, figs. 36, 37.)

The Rev. T. Blackburn (in T. R. S. S. A., 1893, p. 140, by a slip of the pen speaking of the species as *iridiventris*) calls attention to the fact that Baly's *I. chapuisi* is a variety of this species.

In the female, and occasionally in the male, the elytra are frequently purple instead of green, and even when green the outer parts are usually purplish.

The pale portion of the elytra sometimes covers most of the surface, but in the female usually about half; it is often more or less triangular in outline and sometimes forms a short broad V, in only one specimen (a male from Mackay) have I seen the two colours sharply defined, as they usually run more or less into each other, and in the males the pale portion is often scarcely traceable.

Hab. N. S. WALES: Tweed, Richmond and Clarence Rivers, Kiama; QUEENSLAND: Brisbane, Cairns, Mackay.

Cryptocephalus aciculatus, Chp.

(Plates XXII, XXV, figs. 38, 39, 143, 144.)

There are three specimens in the Macleay Museum from South Australia (two of them labelled "Interior of S. A.") that belong to this species; in one of them the scutellum is blackish-brown, in the others deep black; in the two specimens from the interior the greater portion of the elytra is dark, the basal fascia occupies more than one-third of the surface, and the apical spots are very large, and each appears to be surrounded by a pallid ring; in one specimen the head is entirely red.

Another specimen in the Macleay Museum (from N. W. Australia) differs from the description in being larger (5 mm.), in having the prothoracic spot small, longitudinal and irregular, and the scutellum with a rather large pallid spot.

Cryptocephalus filum, Chp.

(Plate XXII, fig. 40.)

Only the female was known to Chapuis; the male differs in being smaller, with longer antennæ (exactly reaching to the apex of the body) and (in the only specimen before me) the second fascia occupying the whole of the apical two-fifths of elytra; in two females before me this fascia appears to be composed of two large conjoined spots, narrowed towards suture, and leaving a fairly large apical patch of the ground colour; in the male also the abdomen is rather dingy instead of being (as in the female) a clear lemon-yellow. Baly referred the species to his genus *Paracephala* (=*Schizosternus*); the hinder apex of the prosternum, however, is much less deeply excised than in his *P. pectoralis* (= *S. albogularis*), although it might fairly perhaps be regarded as semicircularly emarginate; it is, moreover, so closely applied to the mesosternum that it can only be separated with difficulty.

Cryptocephalus argentatus, Chp.

(Plate XXII, figs. 41, 42.)

Idiocephala bella, Baly.

This is a variable species of which I have taken several pairs *in cop.* The elytral markings of the male are

occasionally exactly as in the ordinary female described by Chapuis, but usually the apical third is black, the black portion converging obliquely from each side to the suture.

The description of *Idiocephala bella*, Baly, appears to have been drawn up from a normal female of this species.

A variety (of which there are four specimens before me, one of which was taken *in cop.* with a male as described by Chapuis) of the female occurs in which the elytra are occasionally entirely black; these females look very much like the specimens I believe to be *Loxoplcurus conjugatus*, except that they are larger, but they may be at once distinguished by the sculpture of the head.

Hab. N. S. WALES: Sydney, Gunning, Tamworth, Galston, Forest Reefs, Queanbeyan, Jenolan; S. AUSTRALIA; QUEENSLAND: Brisbane, Wide Bay, Mackay.

CRYPTOCEPHALUS DICHROUS, Chp.

(Plate XXIII, figs. 43, 44, 45, 46, 47.)

This is a very variable species, closely allied to *argentatus*, and with many of its varieties resembling varieties of that species to a remarkable degree; *dichrous*, however, has a longer prothorax, slightly shorter scutellum, stouter antennæ, and head with simple or almost simple punctures; whilst in *argentatus* the upper half of the head is densely and finely strigose ("longitudinaliter aciculata").

I have only seen two specimens (one from Port Denison, the other from N. W. Australia) agreeing exactly with Chapuis' description of the colours of this species; usually the sides and apex of elytra are narrowly margined with dull red, the head (except for the eyes) is usually entirely pallid; usually the five, but sometimes six, basal joints of antennæ are pallid, whilst in two specimens parts of the 7th and 8th are also pallid; the tarsi are sometimes entirely pallid, although the 3rd joint is usually darker than the others; the abdomen and metasternum are occasionally infuscate. It is in the elytra, however, that the greatest variation occurs. The following forms are before me.

Elytra entirely greenish-blue (as in the type).

Elytra greenish-blue, narrowly margined with dull red (this appears to be the more normal form).

The same, except that there is an obscure subbasal fascia in the form of a broad V (the V variable in size).

The same, except that the fascia is interrupted towards the suture.

Elytra pallid, the base and a large subapical spot on each greenish-blue. This is a common form; frequently the basal marking is obscurely advanced for a short distance along the suture, sometimes it is absent except at the extreme base, the subapical spots never touch the margin, but occasionally the suture, they are often rounded, but sometimes triangular.

Elytra pallid, the base a subapical spot on each, and an intermediate spot on suture greenish-blue.

Elytra pallid except at extreme base, and a slight subapical infuscate patch.

Elytra pallid except at extreme base, and two small transversely conjoined subapical spots.

Elytra pallid except at extreme base.

In the pallid varieties the scutellum (except at its extreme base) is nearly always pallid.

Hab. QUEENSLAND: Port Denison; N. W. AUSTRALIA; S. AUSTRALIA.

IDIOCEPHALA CATOXANTHA, Saund.

(Plate XXIII, fig. 48.)

The Rev. T. Blackburn describes as a possible variety of *catoxantha*, a species from the Northern Territory, of which there are three specimens from N. W. Australia in the Macleay Museum, varying from $1\frac{3}{4}$ to $3\frac{1}{4}$ lines (Blackburn's specimens varied from 2 to $3\frac{2}{5}$ lines); at the same time he says he believes the species to be truly *catoxantha*, and this is probably the case. Saunders describes the scutellum as "pitchy-brown," Blackburn does not notice it in his description. In the three specimens mentioned above the scutellum is concolorous with the prothorax except for a narrow blackish basal border.

IDIOCEPHALA TASMANICA, Saund.

var. *Loxopleurus crassicostatus*, Chp.
? *Loxopleurus impressicollis*, Boh.

In Masters' catalogue referred to *Loxopleurus*. A specimen from the Sydney Museum (without locality) agrees exactly with the description; in others from New South Wales and Tasmania there is a narrow stripe along the median line of the prothorax, commencing at the apex and not quite extending to the base; on a Tasmanian

specimen the pale elytral markings are not confined to the base and apex, but are irregularly distributed over the disc as well.

A specimen from Tambourine (Queensland) in Mr. Illidge's collection differs in having the outer parts (but not the extreme margins) of both prothorax and elytra darker (instead of paler) than the general colour, but I can only regard it as a variety.

Loxoplcurus crassicostatus appears to have been founded upon a variety of this species having the pectus black; I have one specimen from Sydney in which the greater part of the metasternum is black, but in five others it is of a reddish-brown, but very distinctly darker than the abdomen.

The costæ of the elytra in this species are much more pronounced in some specimens than in others both as regards their colour and size.

It seems to me quite probable that *Loxoplcurus impressicollis*, Boh. (re-described by Suffrian) may be referable to this species.

Idiocephala subbrunnea, Saund.

Mr. Saunders described the scutellum and "mesosternal region" as black; in two specimens from Kiama before me the metasternum but not the mesosternum is black; in one the scutellum is almost entirely black, but in the other it is black only at the base.

This species is given in Masters' catalogue as a synonym of *Darwini*, but I do not know on what authority; I have seen no specimen agreeing with the description of *Darwini*.

Idiocephala bynoei, Saund.

Cryptoccphalus convexicollis, Chp.

(Plates XXIII, XXV, XXVI, figs. 49, 50, 51, 52, 160, 187.)

This is a fairly common species on young Eucalyptus foliage in the coastal districts of Western Australia. In the female the antennæ are slightly shorter than the body, in the male they are distinctly longer, the scutellum has a large basal fovea; the shape of the postmedian fascia varies very considerably, but never appears to reach the margins; it is sometimes broken up into spots; in one female the basal joint of the antennæ is obscure red; in a male the second, third, and fourth, and the lower part of

the first are red; in this specimen also the elytral punctures are larger and sparser than in other males under examination. I have a pair taken *in copula* in which the elytral punctures are very different *inter se*.

Two specimens before me from the Swan River at first sight appear to be very distinct from *Bynoei*, but I am satisfied they are varieties only; in one of them the elytral punctures are as in the ordinary female, but the black markings of the upper surface (including the head) consist of a narrow edging common to the prothorax, scutellum, and elytra, but on the latter continued to form a humeral spot (elevated and tuberculiform as in all other specimens of the species), and two disconnected postmedian spots placed as in *Cadmus excrementarius*, Suff.; the antennæ are black, but with the three basal joints more or less obscurely diluted with red; the apex of the tibiæ and the tarsi are black; the metasternum is very slightly infuscate; the other specimen agrees in its markings with this one except that the postmedian spots are slightly larger, and that all the appendages are pallid; its punctures, however, are very much coarser (much coarser than on any other specimen I have seen) both on the prothorax and elytra;* in both these specimens the shape and proportions of the antennæ joints, the scutellum rounded behind with an unusually large basal fovea, are as in ordinary specimens. At first sight it would appear almost absurd to associate this specimen with typical ones of *Bynoei*, but I am convinced that it can only be regarded as a variety of that species.

The species has been re-described by Chapuis under the name of *Cryptocephalus convexicollis*, from quite ordinary specimens. Chapuis records it from Brisbane, Rockhampton, and Swan River; I have only seen specimens from Western Australia.

Idiocephala cyanipennis, Saund.

var. *Cryptocephalus condensatus*, Suff.

(Plates XXV, XXVI, figs. 161, 188.)

Mr. Saunders described this species (giving the locality as "New Holland") as having "under-side of body pale ochreous yellow"; subsequently Chapuis described it as a *Cryptocephalus*, and as having "metasterno vix infuscato."

* These might quite fairly even be called foveate-punctate.

In Masters' catalogue *condensatus* of Suffrian is given as a synonym. Chapuis describes *condensatus* as a distinct species, but in this I think he was wrong, although it differs in a number of particulars from the form described by Saunders. The form truly representative of the species, however, is that described by Suffrian and Chapuis in which the metasternum and abdomen (except at the sides and the intercoxal process) is black or blackish; in this form there is frequently a blackish transverse patch on the prothorax, in some very distinct, in others just traceable. The antennæ are either entirely black (with or without a metallic gloss) or with the five basal joints more or less red, both in the typical form and the variety.

The elytra are usually deep blue or violet, but sometimes greenish, and there are many intermediate shades.

In three specimens from northern N. S. Wales and Queensland having the dark under-surface of *condensatus* the head (except for the eyes) is entirely pallid.

In the catalogue there appear two species bearing the name *cyanipennis* (Nos. 6468 and 6469). Chapuis, however, simply re-described Saunders' species with Saunders' name attached, so that there is really no preoccupied name.

Hab. QUEENSLAND: Brisbane, Bundaberg; N. S. WALES: Tweed River, Sydney, Lane Cove, National Park; VICTORIA: Melbourne.

There is a specimen from S. Australia in the Macleay Museum which I think is probably a variety of this species; it is, however, very large (6 mm.), with the elytra metallic green becoming coppery at the base and the prothorax with a large transverse median black blotch. It is, however, so close to many of the forms of *condensatus* that (having only one specimen to judge from) I cannot regard it as distinct.

IDIOCEPHALA PULCHELLA, Saund.

(Plates XXV, XXVI, figs. 162, 189.)

This species is very closely allied to *cyanipennis*, and the under-surface varies in the same way; the elytra vary from the form described by Saunders ("rich shining green, with a broad rufous brown lateral marginal band produced inwards just below the shoulders") to entirely purple; in two specimens before me the elytra are metallic green with

coppery reflections. The sides near the shoulders are usually diluted with red; the scutellum is usually pallid except at the base, but in five specimens it is entirely dark. The five basal joints of antennæ are more or less red; I have never seen them entirely dark as they frequently are in *cyanipennis*.

The species may be distinguished from *cyanipennis* and its varieties by its elytral punctures (not mentioned by Saunders) being much smaller, those on the head more numerous and more or less confluent or strigose, the scutellum more elevated and rounded posteriorly, and the sixth, seventh and eighth joints of antennæ of different shape (in *cyanipennis* they are connected in the middle, in *pulchella* more towards one side).

The male was unknown to Saunders, it differs from the female in being smaller and narrower, with longer and thinner antennæ, prothorax more deeply impressed, elytra with larger punctures, and the eyes larger and closer together.

Two males before me have the elytra metallic green shading off to purple at the apex and sides, the scutellum black and the greater part of the prothorax black (with a metallic tinge) in one and infuscate in parts in the other.

Hab. N. S. Wales: Sydney, Kurrajong, Jenolan, Mount Wilson.

Idiocephala atra, Saund.

Loxopleurus nigritus, Chp.

The sex of his specimen was not mentioned by Saunders; a female was subsequently described by Chapuis under the name of *Loxopleurus nigritus*. The specimens of both entomologists were from Tasmania, where the species is fairly common. I have specimens also from Sydney and Mt. Victoria (N. S. Wales).

The sexes are alike in colour; the male, however, is smaller than the female, with longer antennæ, and the space separating the eyes considerably less.

Two specimens (sexes) from S. Australia have the punctures (especially on the prothorax) considerably larger (although perhaps not more numerous) than in the normal form, but as there appear to be no other differences (even in colour) I can only regard them as representing a variety.

IDIOCEPHALA ALBILINEA, Saund.

Idiocephala marginicollis, Saund.

(Plate XXIII, fig. 53.)

As noted in Masters' catalogue, Saunders described the male as *marginicollis*. The species is fairly common in early summer.

Hab. TASMANIA; VICTORIA: Gisborne; N. S. WALES: Goulburn; S. AUSTRALIA: Port Lincoln.

IDIOCEPHALA FLAVIVENTRIS, Saund.

(Plate XXIII, figs. 54, 55.)

Referred by Baly to *Euphyma*. The species occurs near Sydney, but appears to be rare; in all the specimens I have seen there is a wide subtriangular black patch in the middle of the metasternum.

IDIOCEPHALA NIGRIPENNIS, Baly.

I have seen three specimens which I refer to this species; in only one of them, however, are the elytra black, and even then with a bluish gloss; in the other two the elytra are decidedly bluish; the scutellum in one is black, in the others it is somewhat reddish. The species appears to be distinct by its entirely red head, prothorax with wide and pallid (almost transparent) margins, the surface sparsely punctate, and the elytra with coarse punctures in distinct series.

OCHROSOPSIS VERMICULARIS, Saund.

I have several species under examination which agree fairly well with the *specific* description of this insect. The specimens which I refer to the species, however, have the scutellum very slightly longer than wide, the base slightly wider than the apex, slightly notched, and narrowly bordered with black, and with the sides slightly incurved. In Saunders' diagnosis of the genus *Ochrosopsis* the scutellum is described as "subquadrate," but in the description of *vermicularis* its shape is not mentioned. All the closely allied species here noted or described, however, except the above described ones, have the scutellum decidedly transverse.

Two of these specimens are from New South Wales

(Forest Reefs and the Blue Mountains); Saunders' specimen was from "New Holland"; in both (females) the antennæ are slightly longer than the body (Saunders says of *vermicularis* that they are "as long as the body"), and the elytral punctures are frequently dark brown instead of black. The specimen from Forest Reefs was compared and agrees with a specimen in the Macleay Museum bearing the name *vermicularis*, but on what authority it was so named I do not know.

A male specimen from Tasmania (Mt. Wellington) appears to be the male of the species, it has the metasternum in places clouded with black (probably an individual or local variation). It differs from the above noted females in being longer and narrower, with much stouter antennæ, and which are just as long as the body; its head is densely punctate only (in the females the head is strigose as well), and its legs are stouter, the punctures of the upper surface are more crowded together, and are invariably black.

Ochrosopsis subfasciatus, Saund.

var. *Ochrosopsis melanocephalus*, Saund.

(Plates XXV, XXVI, figs. 163, 190.)

This is a common species and a variable one both sexually and individually; moreover, specimens which have been for some time in spirits frequently have a different appearance to those which have been killed with the fumes of chloroform or other non-fluid-killing agents.

The specimen described by Saunders appears to have been a female, the male differs in being smaller and frequently with the vertex and a line down the face black, the brown portions of the elytra are as a rule greater in extent in the females than in the males. Tasmanian specimens are usually darker than those from the mainland, and their elytra might often be called reddish-brown with three pallid irregular fasciæ (one basal, one median, and one apical). On the prothorax of the male (and very rarely also on the female) there are often two dark longitudinal stripes. The scutellum is subcordate with a rather large basal notch.

A male specimen from Hobart, which I can only regard as a variety of *subfasciatus*, agrees exactly with Saunders' description of *melanocephalus*; this specimen agrees exactly

in structure with the ordinary males of *subfasciatus*, but is the only one I have seen having the scutellum and parts of the metasternum and legs black.

Hab. S. Australia; Victoria: Gisborne; N. S. Wales: Jenolan, Mts. Victoria and Wilson; Tasmania: Hobart, Ulverstone, Strahan.

Ochrosopsis rufescens, Saund.

The scutellum in this species varies from flavous to black. Saunders appears to have seen only the female, the male differs in being considerably smaller and with longer antennæ. The head varies slightly in its depth of colour, and there is occasionally an infuscate line down the middle; the extent of the pallid space at the apex of the elytra varies in extent.

Hab. Tasmania; S. Australia.

Ochrosopsis apicalis, Saund.

Specimens from Tasmania (the original locality) which I refer to this species differ from *rufescens* slightly in colour, but more particularly in having the sculpture of the prothorax and elytra much more irregular, the elytra with an irregular but very distinct lateral carina, and the scutellum, except at apex, quite coarsely punctate; in *rufescens* the scutellum is also punctate but the punctures are at the sides and much less numerous and profound. The prothorax also is decidedly smaller than in *rufescens* and the clothing of the under-surface is longer and more silvery, that on the abdomen of *rufescens* being very short.

From Glen Innes (N. S. Wales) I have numerous specimens which agree in all structural details with the above noted Tasmanian ones, but the colour of the upper-surface is paler and the shades of colour more diffused and less strongly contrasted, the metasternum and part of the abdomen is black in the males and piceous or infuscate only in the females; in these specimens * the apical third of the eleventh joint is blackish. These specimens are probably typical, the ones above and below noted probably being varieties.

From Tasmania I have three males and one female (the latter taken *in copula* with one of the males) which appear

* As in all others which I have seen, although it is sometimes very indistinct.

to constitute a distinct variety; in all of them the metasternum and abdomen (except the two apical segments and apices of the others) are black; in the males there is a small blackish blotch in the middle of the prothorax (in two of them this blotch has a greenish, in the other a bluish gloss); all three have an infuscate streak along the face, and in one the vertex is black. In one of the males the dark parts of the elytra are confined to the punctures, in the others only the apex is pallid (except for dark punctures); in the female all the punctures are dark and there is an irregular transverse space towards the apex where the colour is darker than elsewhere.

Ochrosopsis erosus, Saund.

From New South Wales, Victoria, Tasmania and South Australia there is a species which in several museums bears the name of *erosus*, and really appears to be that species although the legs and a widely triangular patch on the metasternum are black; in all other particulars, however, it agrees with the description. It should perhaps bear a varietal name. The species was described originally as from the Swan River.

Ochrosopsis australis, Saund.

A specimen from the Swan River appears to be referable to this species; the vertex of its head, however, is black, whilst that of *australis* is described as ochraceous yellow. A similar specimen from South Australia is in the Macleay Museum.

Ochrosopsis eruditus, Baly.

(Plates XXIII, XXV, figs. 56, 164.)

Dr. Baly's specimen had broken antennæ; in both sexes the antennæ are as described by him, but in the female the sixth and seventh joints are wider than in the male; in both the eighth and ninth are also compressed, but to a less noticeable extent, the tenth is slightly compressed and the eleventh is almost cylindrical except at the tip; the antennæ of the male are considerably longer than those of the female. In two specimens before me the prothorax has a small black median spot—rounded in one (a female), produced in the form of a wedge towards the base in the other (a male); on the latter the metasternal episterna

and flanks of mesosternum are black, in the other only parts of the former are black; whilst in a female having the prothorax immaculate these parts are but slightly clouded.

A variety from South Australia in the Macleay Museum has the elytra entirely purplish-violet, with the prothoracic spot small and irregular.

Rhombosternus antennatus, Baly.

Dr. Baly describes the colour of this species as "*piceo-fulvus*"; possibly his specimen was old and dirty. I have before me three specimens, which appear to be referable to his species, in which the colour is a rather pale testaceous-yellow, with the abdomen and ocular emarginations pale flavous. The male differs from the female in being smaller, narrower, and with the scutellum narrower, the antennæ are not much longer (in both sexes they considerably pass the apex of the body) but are darker outwardly. The prothoracic punctures are subject to considerable variation. Baly says the basal lobe of the prothorax is biemarginate; this is not really the case although it appears to be so owing to the large basal notch of the scutellum dividing its base into two large lobes, so that as it slightly overhangs the prothorax, the base of the latter appears to be biemarginate.

Hab. King George's Sound.

Rhombosternus sulphuripennis, Baly.

(Plate XXIII, fig. 57.)

Hab. S. Australia.

Prionopleura bifasciata, Saund.

I have specimens from Sydney and the Blue Mountains which agree with the description and figure of this species. In the figure the male is shown as having pallid antennæ but it is not so described; the normal female has pallid antennæ and legs with femora either black or infuscate, its prothoracic and elytral markings are much less sharply defined than in the male but of the same type.

From Jenolan I have a specimen which differs from the normal form in having the under-surface (except for small and obscure lateral spots), the antennæ (the first to fifth

joints more or less diluted with red) and the legs, black; its head is mostly black, its prothorax is darker than usual but with normal markings, and its elytra have the two fasciæ represented by obscure spots and still more obscure stains.

In Masters' catalogue the species appears both as being distinct (6407) and as a synonym of *gigas* (6417). Suffrian describes as *gigas*, Oliv., a species appearing in the catalogue under *rubiginosus*, Boi. (6431). Unfortunately I have not Olivier's original description of *gigas* for comparison.

Prionopleura cognata, Saund.

The colour of this species is variable to a certain extent; the black markings of the elytra (never sharply defined) are occasionally absent; in the males the legs are frequently almost entirely black, whilst in the females they are often entirely red.

Hab. Tasmania: Huon River, Hobart, Mt. Wellington, Launceston; N. S. Wales: Sydney, Blue Mountains.

Prionopleura erudita, Blackb.

(Plates XXIII, XXIV, figs. 58, 122, 123.)

The maculate femora render this species unusually distinct. The male (unknown to Blackburn) differs in being smaller with the dark markings covering a greater portion of the upper-surface; the antennæ are longer and some (in the only male I have seen both antennæ are broken) of the joints are darker.

Hab. S. Australia.

Three specimens from Brisbane appear to represent a variety of this species, in all of them the prothoracic U is very indistinct although traceable, and the elytral markings instead of being sharply defined are feeble piceous blotches only in two and entirely absent in the other; in all three the two terminal joints of the antennæ (instead of the terminal one only) are dark. The sculpture and femora, however, are as given for *erudita*.

Aporocera apicalis, Saund.

I have the sexes of this species from N. W. Australia; *

* There are specimens in the Macleay Museum from King's Sound (N. W. Australia); Wide Bay, Port Denison and Mackay (Queensland).

the male is smaller and narrower, with the antennæ considerably stouter than in the female, and slightly longer than the body (those of the female being shorter); it has the under-surface in many places diluted with red, that of the female being black, as in the type. The specimens (probably females) described by Blackburn* from the Northern Territory seem to be typical, except for very slight differences in colour.

Aporocera bicolor, Saund.

There is a specimen from Port Darwin, in the Macleay Museum, which is possibly a variety of this species; it differs from Saunders' description in having the scutellum (except at base) pallid, the elytra blackish-brown with a slight greenish gloss and with (except at apex) narrow pallid margins, the greater portion of the abdomen is black, the legs are pallid except the tarsi and apices of tibiæ. In this specimen the scutellum (not mentioned by Saunders) is triangular, rather strongly notched at base, and with a small but distinct puncture close to apex.

Brachycaulus ferrugineus, Fairm.

var. *Onchosoma ewingi*, Saund.
„ „ *dorsalis*, Saund.
„ „ *tasmanica*, Saund.
„ „ *foveicollis*, Saund.
„ „ *rufescens*, Saund.
„ *Cadmus verrucosus*, Chp.

This is a widely distributed and in many respects a very variable species. The specimens before me vary in length from 5 to 6 mm. in the males, and from $5\frac{1}{2}$ to $7\frac{1}{2}$ mm. in the females.

The most conspicuous feature of the species is the presence of three velvety black (or brown) spots on the prothorax, one median and two lateral (the latter usually invisible from above); these spots are often surrounded by pale rings, frequently the median one is not at all sharply defined, and it is occasionally of a dull brown and distributed over the tuberosities as well, so that (as a velvety black spot) it may fairly be said to be absent; the lateral spots, however, are always distinct and are usually very sharply defined, they are usually about half the size of the

* P. L. S., N.S.W., 1888, p. 1474.

median spot; the latter is usually oblong-elliptic. There is always a narrow black margin at the base of the elytra and scutellum. The head varies from entirely black to entirely reddish-brown, but is usually black, with a few indistinct reddish-brown spots in the male, and reddish-brown with a few more or less blackish spots in the female. In the male there is usually a dark (sometimes quite black) stripe on each side of the middle of the prothorax, the dark portions being frequently confined to the two large tuberosities. The intercoxal process of the abdomen is always paler than the surrounding surface, and there is usually a transverse black patch behind it. The tuberosities on the elytra vary considerably in number and elevation, and are usually more clearly defined in the males, the largest one on each is always granulate and close to the base.

The antennæ of the male if drawn back over prothorax would pass the scutellum, those of the female if so drawn back would scarcely reach the base of the median velvety spot. In the male also the prothoracic tuberosities are usually more pronounced and with a greater space between them than in the female.

Usually Tasmanian specimens are darker than those from the mainland; those from Mt. Kosciusko, however, are as dark as Tasmanian ones. On the elytra of specimens from Tasmania and Mt. Kosciusko there is frequently in both sexes an oblique slightly curved pale stripe. In the elytra, however, there are frequently no distinct markings to be seen, the surface being obscurely mottled; in many, however, there is a somewhat obscure pale triangular patch on each elytron, the triangles approaching each other at the suture slightly beyond the middle; usually a triangular space, at the sides of and behind the scutellum, is darker than the rest of the elytra.

A specimen from N. W. Australia is paler than usual and with the median prothoracic marking reduced in size and subtriangular in shape.

Of the six species of *Onchosoma* described by Saunders I am confident that *Ewingi*, *dorsalis*, *Tasmanica*, *foveicollis* and *rufescens* should be regarded either as varieties or pure synonyms of *ferrugineus*; *Klugii* is distinct; *Cadmus verrucosus*, Chp., appears also to be only a variety of this species, I have seen specimens of it from Mackay.

Hab. QUEENSLAND; N. S. WALES; VICTORIA; TASMANIA; S. AUSTRALIA; W. AUSTRALIA; N. W. AUSTRALIA.

Onchosoma klugii, Saund.

Four female specimens before me (there are others in the Macleay Museum) probably belong to this species. In all of them the prothoracic tubercles are large, gently rounded in front and almost vertical behind, the elytral costæ (Saunders says: "Elytra . . . with irregular strongly elevated longitudinal nervures") are as follows:—one just behind scutellum commencing with a tubercle and terminated at basal third, a sinuous one commencing at base and continuous to near apex, one between this and shoulder commencing about basal fourth and ending at apical third, and one just below shoulder, this at a short distance from the base bifurcates, the outer arm extending almost to apex, the inner not quite so far, but immediately behind it (in some specimens feebly conjoined with it) is a rather large tubercle with a spur extending between the two arms; the shoulders are also tuberculate. All the tubercles, including those on prothorax, are granulate in appearance; the elytral costæ are slightly variable and on one specimen are all conjoined, on another the arms of the outer costa become joined together in the middle so as to enclose an elliptic space. The elytral colours are in very irregular bands and become obscured with age. Saunders describes the ground colour as yellow-brown; this is the case with three of the specimens before me, but on a recently captured one the ground colour is of a clear lemon-yellow.

Hab. Queensland: Tambourine, Wide Bay; N. S. Wales: Blue Mountains, National Park, Sydney.

Chariderma pulchella, Baly.

(Plates XXIII, XXIV, XXVI, figs. 59, 124, 191.)

I have two specimens (sexes) from Brisbane (there are others in the Macleay Museum from Ropes Creek and Clarence River) which differ from Baly's description in having four elytral spots (the second pair beyond the middle and close to suture). The male differs from the female in being smaller ($3\frac{1}{2}$ lines instead of $4\frac{1}{2}$) with longer antennæ, the middle joints of which are rather more inflated than in the female, and with almost the whole of the ninth joint black instead of only the apex; the lower surface and pygidium have a bluish gloss in both specimens (in the type these parts are described as "nigris"). As in all

particulars of sculpture mentioned by Baly and in all its colours (some of them very unusual) except the differences noted, these specimens agree with the description, I have not ventured to describe them as new.

Diandichus analis, Chp.

(Plate XXV, fig. 165.)

I am confident that I know this species, although it has never been formally described. The generic description, however, is ample, and this with the brief notes at its foot and the coloured figure have enabled me to identify the species on eight specimens from South Australia. The two specimens known to Chapuis were females; in addition to the few colour details mentioned by him the following may be noted:—The head is black except the parts in front of antennæ (in two females, however, the head except for parts of the mandibles is entirely black just as in the males), the antennæ, scutellum, four hind-legs and front tarsi are black, the front femora and tibiæ are obscure red in places stained with piceous. The abdominal fovea is unusually large, occupying almost half the total width and touching the third segment. The resemblance to some small Malacoderms (e. g. *Hypattalus australis*, Fairm., and *H. abdominalis*, Er.) is rather striking.

The male differs in being smaller, with longer antennæ, the head (except for parts of the mandibles) and the prothorax black, and with the parts of the abdomen that are flavous in the female, dull piceous-red.

Cyphodera chlamydiformis, Germ.

Hab. N. S. Wales: Sydney; Victoria: Diamond Creek.

Schizosternus coccineus, Chp.

(Plate XXIII, figs. 60, 61.)

There are two specimens in the Macleay Museum from Port Denison which I refer to this species. They are marked as having been taken *in cop.*; the female agrees in colour with the original description, but the male is without the subapical spots. The male is smaller and narrower than the female, with the antennæ extending almost to apex of elytra, those of the female being distinctly shorter. Its head is densely and rather coarsely punctate, with the

punctures towards the sides and more or less confluent, and with the eyes much closer together than in the female; on the head of the latter there is a rather wide lightly punctate longitudinal shining space.

Schizosternus albogularis, Chp.

Paracephala pectoralis, Baly.

(Plate XXIII, figs. 62, 63.)

Specimens from Ipswich (Queensland) before me agree very well with Chapuis' description of *albogularis* (described in June 1876), they also agree with Baly's description of *Paracephala pectoralis* (described in August 1877). The interrupted median fascia is of variable width, appearing sometimes as a rather small spot on each side, and in others extending almost to the suture.

Chloroplisma viridis, Saund.

Loxopleurus metallicus, Chp.
var. *Loxopleurus corruscus*, Chp.
„ „ *chalybæus*, Chp.

This species is variable to a great extent, but has many quite constant varieties; I have it from Forest Reefs, Armidale, Sydney, and Jenolan, in N. S. Wales, and from many localities in Tasmania.

In the males there is usually a shining impunctate longitudinal space towards the base of the prothorax, this space being more pronounced in some than in others; in the female, although sometimes fairly distinct, it is frequently not traceable. In many specimens (independently of sex) there is near the sides of the elytra a moderately distinct epipleural fold, but in many others it is scarcely or not at all traceable. The colour of the tibiæ and tarsi (especially of the front legs) is very subject to variation.

The common form of the male is of a bright metallic green, and was described and figured by Saunders as *Chloroplisma viridis*; the common form of the female is coppery, and was described by Chapuis as *Loxopleurus metallicus*. Very often the green male has the prothorax with a more or less coppery gloss, this gloss often being extended to the shoulders.

A very beautiful variety in which the prothorax is of fiery copper and the elytra rather deeply margined with

purple has been described by Chapuis as *L. corruscus*; it appears to be very rare, I have seen but one specimen of it, from Forest Reefs.

A rather common variety of the male has the head and prothorax of a fiery (often reddish) copper, with the elytra purple or purplish-blue; its corresponding female is purple or purplish-blue, often with a greenish gloss; such a female has been described by Chapuis as *L. chalybæus*.

A moderately common variety of the female has the head and prothorax deep blue and the elytra purple.

Another variety of the female is entirely purple except for a blue space towards the base of the elytra.

Mitocera viridipennis, Saund.

Cryptocephalus perlongus, Chp.

(Plates XXIII, XXV, figs. 64, 65, 166.)

Only the male was known to Saunders, who described it as coming from the Swan River, this locality possibly being erroneous; the species may occasionally be taken on the leaves of young Eucalypti in summer; it is fairly common in Tasmania and the mountainous parts of N. S. Wales and Victoria. Baly referred it to *Ochrosopsis*, calling attention to the fact that it had been re-described by Chapuis, to whom both sexes were known, as *Cryptocephalus perlongus*. In a male from Tarago (N. S. Wales) there is a pallid elliptic spot on each elytron, about the middle, close to the suture and slightly oblique in position; there are also two somewhat similar specimens in the Tasmanian Museum, on one of them the spots are about half, on the other about twice the size of those on the Tarago specimen; Mr. H. H. D. Griffith has a specimen from Gisborne (Victoria) in which the pallid marking extends over most of the surface: specimens of both sexes have occasionally a purplish gloss on the elytra, and I have seen a female with entirely purple elytra.

Loxopleurus auriculatus, Suff.

A small coarsely sculptured species very distinct on account of the yellowish subhumeral lobes.

Hab. S. Australia.

Loxopleurus gravatus, Chp.

(Plate XXIII, fig. 66.)

Both sexes of this species were known to Chapuis, but the male described by him and coloured as the female may not be the normal form, I have seen but one specimen of it. The ordinary male (of which eight specimens are before me) has the basal half (sometimes slightly more and sometimes slightly less) of the elytra reddish-yellow, the two colours being sharply defined; occasionally the suture is narrowly edged with black. In the female the second and third and sometimes parts of the other joints of the antennæ are pallid, as well as the lower surface of the first.

Hab. Queensland: Brisbane; N. S. Wales: Lane Cove, Sydney, Galston, National Park.

Loxopleurus obtusus, Chp.

This is a common species about the Swan River, and of which only the male was known to Chapuis. The prothorax of the male is usually plain black, but occasionally with a bluish gloss; in one specimen under examination the tibiæ are dusky red, but they are usually black. The female differs in being slightly larger, the antennæ shorter, the prothorax red, with a very narrow basal margin of black and occasionally a feeble blackish cloud in the middle of the base; the elytra are usually deep blue, sometimes violet-blue, and occasionally dark bluish-green.

Loxopleurus semicostatus, Chp.

This species is slightly variable in colour. The scutellum is either entirely black or (as in the type) black at the base only. The dark sutural marking sometimes extends to the middle and sometimes is scarcely perceptible even at the base.

The male (unknown to Chapuis) differs in being much smaller ($2\frac{1}{2}$–3 mm.), the antennæ longer (in the female they are shorter) than the body and more or less infuscate, the third and the apex of the first and second tarsal joints are also dark, and the under-surface is black, with the exception of the anterior angles of the prosternum and the apical segments of abdomen.

In general appearance it resembles some of the varieties

of *Ochrosopsis apicalis*, Saund., but can be readily distinguished from that species by the distinct elytral costæ, each of which has numerous close transverse impressions.

Hab. N. S. Wales: Blue Mountains, Sydney.

Loxopleurus subvirens, Chp.

Four specimens from Tasmania and two from Victoria before me may belong to this species, in all of them the upper-surface is of a dark metallic green with a more or less coppery gloss on the prothorax; the under-surface is black with green or blue or coppery reflections. The female differs from the male in being larger, with shorter antennæ and less parallel-sided elytra. As Chapuis says, however, "*scutello magno convexo*," I am somewhat doubtful, as the scutellum (although raised behind in the normal way) is rather flat and by no means above the usual size.

Loxopleurus atramentarius, Chp.

Dr. Chapuis describes the colour of the legs of this species as "*nigris obscure rufescentibus*." I have numerous specimens before me which I refer to the species; in a pair taken *in cop.* by Mr. Masters the female has the anterior legs and posterior tarsi red, the rest of the legs being black; the male has the legs entirely red, except that the hind femora and the tarsi are infuscate. Usually in both sexes the legs are black with the exception of the anterior pair which are often more or less infuscate; in some specimens, however, all the legs are more or less red. The prothoracic punctures vary considerably in size and are usually larger in the male than in the female.

Hab. Queensland: Rockhampton, Wide Bay, Port Denison, Brisbane; N. S. Wales: Sydney, Canterbury, Bargo, Hunter River, Kiama; S. Australia; W. Australia: Mt. Barker.

Loxopleurus erythrotis, Chp.

(Plate XXIII, fig. 67.)

From the Swan River I have three males of this species, which is remarkable for its very stout legs (a character not mentioned by Chapuis). The pallid space at the apex of the elytra varies considerably in extent; in one of my specimens also the four hind femora are quite black, and

there is an obscure brownish streak connecting the dark space in front with the base of the prothorax. The female is probably very different in appearance to the male.

LOXOPLEURUS CHALCEUS, Chp.

In the male the legs (in all the numerous specimens I have from Tamworth*) are entirely pallid, in the female the hind, the four hind, or occasionally the whole of the femora are clouded with piceous.

LOXOPLEURUS LÆVIUSCULUS, Chp.

A specimen from Jenolan may belong to this species (the exact locality of his specimen was unknown to Chapuis), but is larger (4 mm.) than the type, and the third and fourth and lower surface of the first and second joints of the antennæ are obscurely reddish, whilst in the type the antennæ are said to have "*articulis* 5 *primis fuscis.*"

LOXOPLEURUS CONJUGATUS, Chp.

A specimen from Tamworth before me probably belongs to this species, but differs from the description in having the hind femora clouded with black; this, however, is a common variation in the subfamily.

LOXOPLEURUS PICEITARSIS, Chp.

Only the female was known to Chapuis; the male differs in being smaller, with longer antennæ, the lower half of the head and the front margin of prothorax reddish (black in the female), the outer and apical margins of the elytra are also usually indistinctly diluted with red; the elytra also have a greenish gloss, whilst in the female the gloss is usually violet, although occasionally dark bluish-green. The prothoracic punctures are smaller and less numerous in the male than in the female.

Hab. N. S. WALES: Kiama, Hunter River, Sydney.

A specimen from Tasmania apparently belonging to this species has only the two terminal joints of the tarsi slightly infuscate.

LOXOPLEURUS GENIALIS, Chp.

Hab. QUEENSLAND: Port Denison.

* Chapuis records the species from "Australie."

Cryptocephalus confinis, n. sp.

♀. Head, antennæ, scutellum, metasternum, middle of base of first abdominal segment and legs, black; elytra metallic blue; elsewhere red.

Head densely and coarsely punctate, especially at sides, an impunctate (or feebly punctate) line down middle. Antennæ thin, slightly shorter than body, second joint less than half the length of third, third and fifth very slightly longer than fourth, the others gradually decreasing in length. *Prothorax* more than twice as wide as long; with rather large irregularly distributed punctures; oblique impressions rather deep and wide; margins narrow. *Scutellum* almost equilaterally triangular; impunctate; base rather deeply notched. *Elytra* with subhumeral lobes of moderate size; basal two thirds with large punctures and with transverse rugulosities, apical third with much smaller punctures subseriately arranged. Apex of *prosternum* obtusely bilobed. Fourth segment of abdomen curved at apex but not interrupted by fovea; the latter with feeble lateral extensions.

Length 4½ mm.

Hab. N. S. Wales: Jenolan (*J. C. Wiburd*).

A second specimen differs in having the lower half of the face, the whole of the under-surface, and the coxæ and trochanters reddish.

The species differs from *Cr. cyanipennis*, Saund., and its varieties in having the prothorax with much denser punctures, the antennæ much thinner and the elytral punctures different. This and the four following species belong to one of the most difficult sections of the genus.

Cryptocephalus mediocris, n. sp.

(Plate XXV, fig. 167.)

♀. Briefly oblong. Black, head (base excepted), antennæ (fifth and sixth joints infuscate, the seventh to eleventh blackish); prothorax (extreme base black), under-surface and legs (tarsi more or less infuscate) reddish. Pygidium and parts of under-surface with short sparse golden pubescence.

Head with rather small scattered punctures, but densely strigose at sides of and behind eyes. Antennæ thin, not extending to apex, second joint about half the length of third, third slightly shorter than fifth. *Prothorax* rather more than twice as wide as long; with rather large irregularly distributed punctures; oblique impressions rather shallow; margins narrow. *Scutellum* transverse,

subtriangular, apex less than half the width of base, base entire. *Elytra* with large subhumeral lobes; with deep and fairly large clearly defined punctures, subgeminate in arrangement and becoming smaller posteriorly; with traces of feeble alternate elevations. Apex of *prosternum* wide and feebly bilobed. Fourth segment of abdomen very narrow in middle but not interrupted by fovea; the latter almost without lateral extensions.

Length $3\frac{3}{4}$ mm.

Hab. QUEENSLAND: Endeavour River (Macleay Museum), Mackay (*C. French*).

The three specimens before me are uniformly coloured and without bluish gloss on the elytra.

The species differs from the dark variety of *Cr. argentatus*, Chp., in being larger and with the abdomen pallid; from *Id. nigripennis*, Baly, it differs in its prothoracic margins being less than half the width that they are in that species, and the antennæ much thinner; from *vicarius*, n. sp., it differs in its shorter and thinner antennæ, narrower prothoracic margins and smaller punctures.

CRYPTOCEPHALUS APPENDICULATUS, n. sp.

♂. Head (front excepted), antennæ, extreme base of prothorax, scutellum, metasternum and parts of legs black; elytra deep metallic bluish-green, elsewhere red.

Head densely punctate, strigose at sides of and behind eyes. Antennæ thin, passing apex of body, second joint less than half the length of third, third slightly shorter than fifth, fifth and eleventh subequal. *Prothorax* about three times as wide as long; with comparatively small and rather sparsely distributed punctures, larger and denser at sides than elsewhere; oblique impressions rather deep; margins narrow. *Scutellum* triangular, apex narrow but truncate, base rather deeply notched. *Elytra* with fairly large subhumeral lobes; densely and coarsely punctate, with transverse rugulosities, punctures subseriately arranged and sparser but not much smaller on apical third. Apex of *prosternum* very wide and feebly bilobed. Two basal segments of abdomen with an oblique ridge commencing on each side of the intercoxal process, diverging hindwards and terminating at the apex of the second segment in a skinny flap, fourth segment not traceable across middle, fifth with a wide shallow impression.

Length $4\frac{1}{4}$ mm.

♀. Differs in having thinner antennæ, not extending to apex, prothorax more transverse; subhumeral lobes rather smaller;

and the abdomen with simple basal segments, the fourth fairly wide in middle and not interrupted by fovea; the latter with distinct lateral extensions.

Length 5¼ mm.

Hab. N. S. Wales: Lane Cove, Clifton (Macleay Museum).

In the male the coxæ, hind femora and base and lower parts of the four front femora are reddish; in the female the legs are much the same except that the hind femora are infuscate towards apex. The abdomen is paler than elsewhere and the upper lip is infuscate.

Although belonging to one of the most difficult sections of the genus the highly remarkable abdominal appendages of the male cause this species to be one of the most distinct in the subfamily.

Cryptocephalus vicarius, n. sp.

♂. Basal half of head, antennæ and scutellum black; elytra metallic blue or purple; tarsi and apex of tibiæ infuscate; elsewhere reddish.

Head densely strigose and punctate, on apical half punctate only, the punctures rather large and sparse. Antennæ not very thin, longer than body, second joint about half the length of third, third distinctly shorter than fifth. *Prothorax* with deep but sparse and not very large punctures, smaller and sparser on disc than elsewhere; margins rather wide; oblique impressions feeble. *Scutellum* subtriangular, longer than wide, convex along middle, apex truncate, base moderately notched. *Elytra* with punctures much as in the preceding species but the subhumeral lobes larger. *Pygidium* densely and rather coarsely punctate. Apex of *prosternum* wide and feebly bilobed. Abdomen with second, third, and fourth segments strongly curved and very narrow in middle.

Length 4 mm.

♀. Differs in having antennæ just extending to apex of body and the abdomen with straight sutures to the second and third segments, the fourth distinct in middle and very feebly encroached upon by fovea; the latter with feeble lateral extensions.

Length 5 mm.

Hab. Queensland: Port Denison, Gayndah (types in Macleay Museum).

The entire space between the eyes is densely punctate and strigose.

The coarse punctures on head and elytra and shape of

elytra distinguish this species from *Id. pulchella*, Saund., the scutellum of different shape from *Cr. dichrous*, Chp., the pallid legs and very coarse punctures with wide prothoracic margins from *Id. cyanipennis*, Saund. From *Id. nigripennis*, Baly (which also has wide prothoracic margins), it differs in its considerably longer and thinner antennæ and coarser punctures, with the scutellum longer, more decidedly triangular and very distinctly notched.

Cryptocephalus blandus, n. sp.

♂. Black; elytra deep metallic blue or green; prothorax (a large blackish blotch in front and extreme base excepted), coxæ and tibiæ (apex excepted) reddish. Pygidium with rather dense silvery pubescence.

Head with moderately large punctures, strigose close to sides of and behind eyes, vertex feebly impressed. Antennæ rather stout, not extending to apex of body, second joint more than half the length of third, third, fourth and fifth subequal, the fifth slightly the longest. *Prothorax* with large irregularly scattered punctures; disc gibbous; oblique impressions rather deep; margins narrow. *Scutellum* triangular, apex very narrow, base entire. *Elytra* with rather small subhumeral lobes; densely and coarsely punctate; with feeble transverse rugulosities, punctures becoming smaller and seriate in arrangement posteriorly. Apex of *prosternum* wide and very obtusely bilobed. Abdomen with the fourth segment just traceable across middle.

Length $2\frac{3}{4}$ mm.

♀. Differs in having the front of the head and the entire abdomen reddish; the prothoracic blotch is also smaller, less sharply defined, and on one specimen appears as an indistinct transverse spot on each side. The head has smaller and sparser punctures, antennæ shorter, somewhat thinner. Prothorax more transverse and less gibbous and the subhumeral lobes smaller. Abdomen with fourth segment not visible in middle; apical fovea larger than usual and without lateral extensions.

Length 3 mm.

Hab. W. Australia: Swan River, Pinjarrah, Darling Ranges (*A. M. Lea*).

I have put this in the section having the hinder apex of prosternum bilobed, although the lobes are anything but distinct; in fact from some directions the apex appears to be entire.

Differs from the female of *Lox. obtusus*, Chp., in having

considerably stouter antennæ, elytral punctures different and female with red abdomen; from *Id. cyanipennis*, Saund., in its much smaller size, different elytral punctures and in the antennæ and scutellum; from *confinis*, n. sp., in being smaller, in having shorter and stouter antennæ, with the second joint more (instead of less) than half the length of third, and the fourth abdominal segment just traceable (instead of distinct) across middle.

Cryptocephalus quadratipennis, n. sp.

♂. Dark blackish-brown. Pygidium and under-surface with rather dense silvery pubescence.

Head moderately densely and not very coarsely punctate, strigose at sides of and behind eyes. Antennæ long and thin, considerably passing body, second joint less than half the length of third, third distinctly shorter than fifth. *Prothorax* not twice as wide as long; with large very irregularly distributed punctures, smaller and sparser on disc than elsewhere; apex much narrower than base; margins very narrow; front strongly gibbous; oblique impressions fairly deep. *Scutellum* subtriangular, apex rather narrow, base rather feebly notched. *Elytra* short, subquadrate, subhumeral lobes rather small, surface uneven; with rather large punctures very regular on posterior half. Apex of *prosternum* wide and very obtusely bilobed. Abdomen with third and fourth segments strongly curved and scarcely traceable in middle.

Length 4¼ mm.

♀. Differs in being more of a chocolate-brown, the head with smaller punctures, antennæ slightly shorter than the body and the elytra rather less uneven; abdomen with the third and fourth segments not visible across middle, the third at sides as wide as fourth but disappearing much before it; fovea with lateral extensions continuous almost to sides.

Length 5½ mm.

Hab. Queensland: Tambourine (*R. Illidge*).

A very distinct species having longer antennæ and shorter elytra than usual, and with the female abdomen of a most unusual type. In the type male there is an indistinct small pallid spot on each elytron about one-third from the base and slightly nearer the suture than the side; these spots are absent on the females. Another male (in Mr. Illidge's collection) has the entire elytra, pygidium and abdomen of a testaceous red. In one of the females the tarsi are paler than the tibiæ, in the other

they are just as dark. The elytra have almost regular interstices posteriorly, but the third and fifth become united at the apical fourth and towards the apex unite with the seventh, towards the base the interstices become very irregular. On all the specimens before me there are traces of a feeble median prothoracic line.

Cryptocephalus compositus, n. sp.

♂. Testaceous; outer half of antennæ and flanks of metasternum infuscate. Pygidium and under-surface with moderately dense silvery pubescence.

Head densely and moderately coarsely punctate, the punctures more or less confluent at sides of and behind eyes. Antennæ long and thin, passing body, second joint not quite half the length of third, third shorter than fifth. *Prothorax* scarcely twice as wide as long; densely and coarsely punctate, the punctures sparser towards middle of base than elsewhere; front gibbous and feebly longitudinally impressed; margins very narrow; oblique impressions rather feeble. *Scutellum* subtriangular, apex truncate and fairly wide, base rather feebly notched. *Elytra* short, subquadrate, subhumeral lobes rather small, surface uneven; with moderately large seriate punctures. Apex of *prosternum* very wide and feebly bilobed. Intermediate segments of abdomen strongly curved.

Length 4¼ mm.

♀. Differs in having the head rather less coarsely sculptured, with the antennæ scarcely (if at all) passing the body; abdomen with the third and fourth segments very narrow in middle; fovea with scarcely visible lateral extensions.

Length 5 mm.

Hab. Queensland: Gayndah (types in Macleay Museum).

The elytra have more or less regular and convex interstices posteriorly, the third and fifth become united at apical fourth and close to apex curve round to unite with the seventh and ninth, towards the base the interstices and punctures become very irregular, with small transverse rugulosities.

In build somewhat resembling the preceding species, but, apart from size and colour, with the antennæ shorter, the prothorax much more coarsely punctate, the scutellum wider at apex and the elytra still more uneven.

Cryptocephalus aurifer, n. sp.

♀. Deep metallic blue; under-surface and appendages black. Flanks of metasternum and of basal segment of abdomen with dense golden pubescence, the other segments with tufts of silvery pubescence at sides; rest of under-surface and pygidium with scattered silvery pubescence, but on the latter forming a distinct median line.

Head rather feebly punctate and shining along middle, and with a feeble median impression; densely punctate and strigose at sides of and behind eyes. Antennæ passing hind coxæ, second joint about half the length of third, third shorter than fifth, sixth–eleventh flattened. *Prothorax* at apex and sides with moderately dense and coarse punctures, elsewhere (especially on disc) with smaller and sparser punctures; oblique impressions feeble; margins narrow. *Scutellum* triangular, apex obtusely rounded, base moderately notched. *Elytra* subquadrate, subhumeral lobes of medium size; punctures moderately large, posteriorly becoming much smaller and more regular; towards base with transverse rugulosities. Apex of *prosternum* very wide and feebly bilobed. Abdomen with third and fourth segments not traceable across middle, fifth rather suddenly depressed; fovea more hairy than usual and without distinct lateral extensions.

Length 4½ mm.

Hab. N. S. Wales: Sydney (type in Macleay Museum).

A deep blue species having beautiful golden pubescence on parts of the under-surface. It somewhat vaguely approaches the *scabrosus* type, although the upper-surface is very smooth compared with that species and all its varieties.

Cryptocephalus purpureotinctus, n. sp.

♂. Reddish-testaceous; flanks of prothorax and the abdomen paler; antennæ, scutellum, tarsi and apex of tibiæ black.

Head densely punctate and strigose. Antennæ not very thin, passing body, second joint half the length of third, third and fifth subequal in length and both distinctly longer than fourth, the others comparatively wide. *Prothorax* more than twice as wide as long, densely and moderately coarsely punctate, with traces of a feeble median elevation on basal half, oblique impressions rather feeble, margins wide. *Scutellum* triangular, apex obtusely rounded, base with a small but acute notch. *Elytra* suboblong, subhumeral lobes rather small; densely and coarsely punctate, with feeble transverse rugosities towards base, towards apex punctures more regular and

sparser although not much smaller. Apex of *prosternum* wide and scarcely visibly bilobed. Intermediate segments of abdomen strongly curved, the fourth not traceable across middle.

Length 4 mm.

♀. Differs in having antennæ shorter than the body and abdomen with the fourth segment not at all and the third just traceable across middle; fovea with very shallow lateral extensions.

Length $5\frac{3}{4}$ mm.

Hab. Queensland (*A. Simson*); N. S. Wales: Kurrajong (*G. Masters*), Richmond River (*A. M. Lea*).

In some specimens there is a faint infuscate streak on the head; the claws are reddish tipped with black. From some directions the punctures of the upper-surface have a greenish or purplish sheen.

I thought at one time that this was possibly a variety of *Id. pulchella*, Saund., but, apart from colour, the punctures are very much coarser and the antennæ of female and scutellar notch are different; in build, however, it somewhat resembles that species.

Cryptocephalus clarus, n. sp.

(Plate XXIII, fig. 68.)

♀. Testaceous-red; abdomen and prothoracic margins almost flavous, basal half of head and the elytra metallic green; scutellum infuscate at sides; antennæ (four basal joints excepted), tarsi and apex of tibiæ infuscate.

Head densely punctate, strigose at base and at sides of eyes, with rather small punctures elsewhere; median line distinctly impressed. Antennæ just passing hind coxæ, second joint more than half the length of third, third scarcely if at all longer than fourth, and slightly shorter than fifth. *Prothorax* with rather small regularly distributed punctures, rather larger at sides than elsewhere; oblique impression rather feeble; margins wide. *Scutellum* transverse, apex about half the width of base, sides curved, base very feebly notched. *Elytra* oblong, subhumeral lobes rather small, densely and coarsely punctate, with transverse rugulosities, punctures becoming smaller and regular posteriorly. *Pygidium* very indistinctly ridged along middle. Apex of *prosternum* wide and feebly bilobed. Abdomen with straight sutures to the third segment, fourth distinct in middle but encroached upon by fovea; the latter with distinct and almost continuous lateral extensions.

Length $6\frac{1}{4}$ mm.

Hab. N. W. Australia (types in Macleay Museum).

In the type a small spot at the apex of each elytron is pallid, in a second specimen these spots are present and there is as well a very distinct pallid transverse triangle (common to both) with its base about one-fourth from the base and its apex just beyond the middle. The elytral punctures are nowhere small though smaller posteriorly.

Differs from *Cr. eruditus*, Baly, in having the head strigose at sides, and the prothoracic margins much wider; the scutellum is also of different shape and the base is much more feebly notched. From *Cr. iridipennis*, Chp., it differs in its shorter and thinner antennæ and the elytra differently punctured and with smaller subhumeral lobes.

Cryptocephalus melanopus, n. sp.

(Plate XXIV, fig. 125.)

♀. Almost flavous; head (mouth parts in places obscure reddish), antennæ, extreme base and three spots on prothorax, scutellum, metasternum, middle of base of abdomen (intercoxal process excepted), and legs (coxæ excepted) black; elytra with two metallic green fasciæ. Head, pygidium, and under-surface with rather long whitish pubescence.

Head densely punctate, the punctures partially concealed by clothing. Antennæ rather short, second joint about half the length of third, third slightly shorter than fifth. *Prothorax* scarcely twice as wide as long; with moderately dense and comparatively small punctures, smaller on disc (which is gibbous in front) than elsewhere; oblique impressions feeble; margins narrow. *Scutellum* subtriangular, longer than wide, apex truncate, base entire. *Elytra* suboblong, subhumeral lobes small; densely but not coarsely punctate, punctures becoming smaller and seriate in arrangement posteriorly. Apex of *prosternum* wide and feebly bilobed. Abdomen with the fourth segment largely encroached upon by fovea; the latter with feeble lateral extensions.

Length 5 mm.

Hab. N. W. Australia (type in Macleay Museum).

The elytral fasciæ do not touch the sides, the basal one is advanced along the suture and on the shoulders, so that its apical edges are concave; the second fascia is at about the apical third and narrows towards the suture. In colour to a certain extent it resembles some of the varieties of *Cr. parentheticus*, Suffr., but the punctures both of prothorax and elytra are very different to those of that species.

Cryptocephalus variipennis, n. sp.

(Plate XXV, fig. 146.)

♂. Elongate-oblong. Reddish-testaceous; pygidium and abdomen flavous; antennæ, a rather wide and continuous vitta on prothorax, scutellum and a subtriangular space behind it, the shoulders, a spot at apical third (rather close to suture), tarsi and apex of tibiæ black.

Head densely and coarsely punctate, punctures more or less confluent at base and sides of eyes; with a distinct median impression. Antennæ rather thin, second joint less than half the length of third, fifth subequal, sixth–ninth wider (the others missing). *Prothorax* with rather large irregularly distributed punctures, sparser and smaller on disc than elsewhere; oblique impressions very indistinct; margins narrow. *Scutellum* subtriangular, longer than wide, apex rather narrow but truncate, base deeply notched. *Elytra* elongate-oblong, subhumeral lobes small; basal third with rather large but not very dense punctures and with transverse rugulosities, elsewhere the punctures are smaller and regular and posteriorly separated by distinct convex interstices. Apex of *prosternum* wide, rather strongly bilobed and with large punctures.

Length 4 mm.

♀. Differs in having somewhat smaller punctures, the antennæ shorter and prothorax rather more transverse; the third abdominal segment is larger than usual, the fourth distinct across middle but considerably encroached upon by fovea, the latter large and deep without lateral extensions.

Length 6¼ mm.

Hab. S. Australia; W. Australia: King George's Sound (Macleay Museum), Swan River (*A. M. Lea*).

In two females before me the antennæ are perfect and pass the third coxæ for a slight distance; judging by the joints that are left in the male, I do not think its antennæ would pass the apex of the body. A male from King George's Sound, in the Macleay Museum, differs in having all the elytral markings conjoined and the basal half of the head black, the sixth–eighth joints of its antennæ are also diluted with red; a female from S. Australia has a small spot at the base of the head, and the suture from the base to beyond the middle (where it joins with the sub-apical spots) black, but the humeral spots are isolated; its antennæ have also the sixth–eighth joints paler than the others.

The description of *Cr. æger*, Chp., reads suspiciously close to this species, but, as in the three specimens before me, the antennæ are black (in one specimen although all the joints are not black it is not only the apical one "fusco"). In all three the scutellum and a wide space on the elytra behind it are black, and the scutellum is strongly attenuated behind, and could not be called "*quadrato*," although not fairly triangular, and Chapuis having at least two specimens, it is very improbable that both were so different to what appears to be the normal markings of this species; he also says, "*metasterno nigro*."

Cryptocephalus clypealis, n. sp.

(Plate XXV, fig. 147.)

♂. Briefly oblong-ovate. Of a peculiar testaceous-red; sides of prothorax, middle of pro- and mesosternum and the abdomen flavous; head (mouth parts excepted), antennæ fourth–sixth and parts of second and seventh joints excepted, a longitudinal vitta on prothorax, scutellum (apex excepted), tarsi and apex of tibiæ black. Black portions of under-surface with silvery pubescence.

Head densely and coarsely punctate throughout, the punctures just as coarse on the clypeus as at the base. Antennæ rather stout, not extending to apex of body, second joint subglobular, slightly more than half the length of third, third distinctly shorter than fifth. *Prothorax* densely coarsely deeply and regularly punctate; oblique impressions scarcely traceable; margins rather narrow. *Scutellum* transverse, punctate; apex not much narrower than base, base with a rather large notch. *Elytra* subquadrate, subhumeral lobes not very large; densely punctate, the punctures at base scarcely larger than on base of prothorax, but (on account of transverse rugulosities) less sharply defined, posteriorly becoming smaller and subseriate in arrangement. Apex of *prosternum* wide and feebly bilobed. Abdomen with the first segment unusually short, the fourth just traceable across middle.

Length 4 mm.

Hab. W. Australia: Swan River (*A. M. Lea*).

A very distinct species. The dark markings of the upper-surface have a greenish gloss, the patch on the elytra commences at the base, is rapidly narrowed to the basal third, then rather suddenly widened, and then abruptly terminated at about the apical third. Towards the apex of the intercoxal process of the prosternum there is an appearance as of a curved and irregular suture, and

which (as the apex itself is closely applied to the mesosternum) at first sight appears to be the true apex.

Cryptocephalus rubicundus, n. sp.

(Plate XXV, fig. 168.)

♂. Oblong-elliptic. Testaceous; junction of prothorax with scutellum and elytra and the tarsi black, outer half of antennæ, suture and metasternum more or less infuscate.

Head with rather large but not very dense punctures, median impression very feeble or absent. Antennæ as long as body, second joint half the length of third, third considerably shorter than fifth. *Prothorax* regularly convex, with fairly dense, moderately large and regularly distributed punctures; oblique impressions scarcely traceable; margins narrow. *Scutellum* very widely transverse, apex not much narrower than base, base strongly notched. *Elytra* rather long, subhumeral lobes feeble; densely but not very coarsely punctate, and with transverse rugulosities, punctures posteriorly becoming smaller and subgeminate in arrangement and close to apex with feebly convex interstices. Apex of *prosternum* moderately wide and just perceptibly bilobed.

Length 4½ mm.

♀. Differs in having shorter and thinner antennæ; fourth abdominal segment distinct across middle but encroached upon by fovea; the latter large and deep with very shallow lateral extensions.

Length 6¼ mm.

Hab. S. Australia (types in Macleay Museum).

In the two females before me the legs are uniformly pallid and the metasternum is very slightly infuscate. The colour of the upper-surface is somewhat like that of *Cr. conjugatus*, Chp., and the male of *Cr. terminalis*, Chp., but the prothorax is more convex and regular, the elytra longer with smaller subhumeral lobes and the antennæ and punctures different.

Cryptocephalus rutilans, n. sp.

♀. Testaceous; junction of prothorax with scutellum and elytra and the metasternum black; outer half of antennæ and apices of tarsal joints and of tibiæ more or less infuscate.

Head densely but not very coarsely punctate, the interstices finely punctate; median impression feeble. Antennæ passing hind coxæ, second joint rather more than half the length of third, third and fifth subequal and not much longer than fourth. *Prothorax, elytra*

and *abdomen* as in the preceding species, except that the punctures are smaller, and on the elytra are geminate in arrangement almost to the base. *Scutellum* transverse, apex half the width of base, base very feebly notched. Apex of *prosternum* rounded and entire.

Length $3\frac{3}{4}$ mm.

Hab. S. Australia (Macleay Museum).

I have referred this species to *Cryptocephalus*, although the apex of the prosternum is produced and rounded, as it is undoubtedly very close to the preceding species (in which the apex is feebly bilobed). In fact, in general appearance (except as to its much smaller size and in the shape of the scutellum) it can scarcely be distinguished from that species.

Cryptocephalus larinus, n. sp.

♀. Rather wide, elliptic-oblong. Testaceous; junction of prothorax with scutellum and elytra, metasternum and tips of claws black, punctures of upper surface deeply stained—those of the elytra with brown, those of the prothorax with black.

Head rather densely and moderately coarsely punctate, the punctures more or less confluent and substrigose at base; with a distinct median feebly punctate impression. Antennæ passing body, second joint one-third the length of third, third very little longer than fourth and distinctly shorter than fifth, eleventh scarcely if at all longer than tenth. *Prothorax* rather more than twice as wide as long; with moderately dense and rather small irregularly distributed punctures and with minute scattered punctures; oblique impressions scarcely traceable; margins very narrow and entire. *Scutellum* strongly transverse, not much wider at base than at apex, base notched. *Elytra* with small subhumeral lobes, densely and moderately coarsely punctate, punctures posteriorly becoming smaller and regular with feebly convex interstices, basal half with transverse rugulosities. Apex of *prosternum* wide and very feebly bilobed. Abdomen with fourth segment distinct in middle; fovea with feeble lateral extensions.

Length $6\frac{1}{2}$—8 mm.

Hab. Queensland: Brisbane; N. S. Wales: Hunter River (Macleay Museum), Inverell (*J. H. Rose*), Armidale (*A. M. Lea*).

In one specimen the whole of the metasternum is black, in another it is black except in middle, in two others the abdominal segments are more or less stained with black.

In two specimens the antennæ are uniformly coloured, in two others the apical half is more or less infuscate.

Differs from *Och. vermicularis*, Saund., in being of different shape, the scutellum very decidedly transverse and the metasternum black; from *Cr. pœcilodermus*, Chp., it differs in being wider, with narrower prothoracic margins, wider subhumeral lobes and different punctures.

In this and the three following species (and all of which belong to a difficult section of the genus) the punctures, owing to their stains, appear to be much bigger than they really are.

Cryptocephalus cariniventris, n. sp.

♂. Pale testaceous, almost flavous; junction of prothorax with scutellum and elytra dark brown; punctures of upper surface deeply stained, those on prothorax and base of elytra darker (almost black) than elsewhere; flanks of metasternum infuscate.

Head densely and coarsely punctate, punctures more or less confluent. Antennæ longer than the body, second joint less than half the length of third, third shorter than fifth, eleventh slightly longer than tenth. *Prothorax, scutellum* and *elytra* much as in the preceding species, except that the prothorax is somewhat wider, with slightly wider margins and denser punctures and the oblique impressions more distinct. Apex of *prosternum* moderately wide and strongly bilobed; of mesosternum quadrisinuate. Abdomen with the third segment just traceable across middle, the fourth appearing as a triangular wedge on each side, the fifth large, of irregular shape, with a large and not very shallow apical impression, bounded at sides and apex by a cariniform ridge.

Length $5\frac{1}{4}$ mm.

Hab. Queensland: Brisbane (*Geo. Compere*).

The apex of the prosternum from some directions appears to be just as deeply excised as in *Schizosternus*, but this appearance is due solely to a longitudinal impression which terminates at the middle of the apex; the abdomen is also peculiar.

The shape of the apex of the prosternum will at once distinguish this from the preceding species; in the male of *Cr. pœcilodermus*, Chp., the third abdominal segment is not traceable across the middle and the apical impression is wider, shallower and with a much less elevated ridge on each side.

CRYPTOCEPHALUS STENOCERUS, n. sp.

♂. Pale reddish-testaceous, elytra flavous; extreme base of head, junction of prothorax with scutellum and elytra, suture and shoulders black; elytral punctures deeply stained with black; antennæ feebly, the tarsi and apex of tibiæ moderately infuscate.

Head densely and moderately coarsely punctate, punctures more or less confluent towards base; with a distinct median line. Antennæ long and thin considerably passing apex of body, second joint subglobular, less than one-third the length of third, third distinctly shorter than fifth, eleventh slightly shorter than tenth. *Prothorax* more than twice as wide as long, regularly convex; with comparatively small and not dense punctures, and with minute scattered punctures; oblique impressions very feeble; margins very narrow and entire. *Scutellum* strongly transverse, apex not much narrower than base, base almost entire. *Elytra* with small subhumeral lobes; with rather small and not very dense punctures, becoming smaller and seriate in arrangement posteriorly, basal portion almost without transverse rugulosities. Apex of *prosternum* wide and just perceptibly bilobed. Abdomen with intermediate segments strongly incurved to but continuous across middle, fifth large, with a fairly wide, shallow, simple depression.

Length 5 mm.

♀. Differs in having the elytral punctures stained with chocolate brown, the antennæ just passing apex of body, abdomen with almost straight sutures to the second and third segments and the fourth traceable across middle; fovea with shallow lateral extensions.

Length 6 mm.

Hab. QUEENSLAND: Rockhampton (types in Macleay Museum).

In both specimens there is a narrow infuscate facial streak, but it is scarcely traceable in the female; on the prothorax of the female the punctures are moderately stained, whilst in the male but very few of them are even slightly stained. The punctures of the elytra being much darker than those of the prothorax (instead of *vice versâ*) should readily distinguish this species from its close allies. Seen from behind the elytra appear to be supplied with regular black lines.

Can be readily distinguished from *Cr. pœcilodermus*, Chp., and the preceding species, by the abdomen of the male having the fourth segment distinct (although narrow) across the middle and the fifth with the depression much smaller and narrower; the antennæ also are different.

From *larinus*, n. sp., the female differs in being smaller, with the fourth abdominal segment smaller, the shoulders black and the under-surface entirely pallid. From *Cadmus sculptilis*, Chp. (which is certainly congeneric), it differs in its legs and the apical impression of the male; in that species the impression is fairly large transverse and very highly polished.

Cryptocephalus sobrinus, n. sp.

♂. Testaceous; junction of prothorax with scutellum and elytra, a narrow facial streak and punctures of upper surface more or less stained with brown; the punctures at base of elytra and on prothorax darker than elsewhere.

Head rather densely and coarsely punctate, the punctures more or less confluent posteriorly; median line feebly impressed. Antennæ thin, second joint about one-third the length of third, third shorter than fifth. *Prothorax* regularly convex, with almost regularly distributed and moderately large punctures, smaller on disc and base than elsewhere, and with rather numerous minute scattered punctures; oblique impressions feeble; margins narrow. *Scutellum* transverse, apex not much narrower than base, base feebly notched. *Elytra* oblong, subhumeral lobes feeble; with round, moderately large, more or less regular punctures, becoming smaller and subseriate in arrangement posteriorly. Apex of *prosternum* very wide and very feebly bilobed. Intermediate segments of abdomen strongly incurved to but continuous across middle, fifth large, middle of apex deeply and almost semicircularly excised.

Length 5 mm.

♀. Differs in being larger, second and third segments of abdomen rather large and with straight sutures, fourth just traceable across middle; fovea without lateral extensions.

Length 6⅔ mm.

Hab. Queensland (types in Aug. Simson's collection).

The scutellum in the male is impunctate but in the female is impressed with a few scattered punctures. The antennæ in both specimens are broken, but in the male eight joints remain and these are uniformly pallid.

The decidedly emarginate apical segment of abdomen in the male readily distinguishes this from *Cr. pœcilodermus*, Chp., *Cad. sculptilis*, Chp., and from any of the preceding species.

Cryptocephalus pallens, n. sp.

(Plate XXV, fig. 169.)

♂. Of a rather dingy flavous; prothorax (the sides more or less diluted) pale reddish-testaceous; basal half of head, antennæ (four basal joints excepted), scutellum and junction of prothorax and elytra black; suture and shoulders, sides of metasternum and the tarsi infuscate.

Head densely and rather finely punctate, base strigose. Antennæ moderately thin, shorter than the body, second joint almost as long as third, third and fourth subequal and distinctly shorter than fifth. *Prothorax* not twice as wide as long, strongly convex, oblique impressions indistinct but fairly deep; densely and coarsely punctate, punctures smaller on disc than elsewhere. *Scutellum* triangular, base entire. *Elytra* diminishing in width from base to apex, subhumeral lobes rather large; densely moderately coarsely and subseriately punctate, the punctures becoming smaller and more regular posteriorly. Apex of *prosternum* very wide and feebly bilobed. Intermediate segments of abdomen strongly incurved to but continuous across middle.

Length 2½ mm.

♀. Differs in having the antennæ shorter and thinner, the elytra with smaller punctures (especially posteriorly) and almost as wide at apex as at base; intermediate segments of abdomen moderately large, the fourth just traceable across middle, fovea larger than usual and without lateral extensions.

Length 3 mm.

Hab. S. Australia (Macleay Museum).

In some female specimens the third joint only of the four front tarsi is infuscate, whilst the flanks of the metasternum appear to be always less dark in the female than in the male; the dark portion of the head has occasionally a slight greenish gloss.

The species is unusually small for *Cryptocephalus*, looking more at home in *Loxoplcurus*, but the bilobed apex of prosternum forbid its being placed in that genus. In appearance it is much like a small specimen of *Cr. conjugatus*, Chp. From the description of *Lox. verticalis*, Chp., it differs in its dark scutellum (with its base entire) and metasternum.

Cryptocephalus lilliputanus, n. sp.

(Plates XXIII, XXIV, figs. 69, 126, 127.)

♂. Deep metallic green with a slight coppery gloss; prothoracic margins, a rather large spot at the apex of each elytron, legs (the two apical joints of tarsi infuscate) and the second and fourth joints of antennæ reddish-testaceous.

Head very densely but not very coarsely punctate, punctures as large on clypeus as elsewhere, and at base and sides of eyes more or less confluent; with a transverse and a longitudinal impression. Antennæ rather thin, shorter than the body, second joint more than half the length of third, third shorter than fifth. *Prothorax* less than twice as wide as long, strongly convex; densely coarsely and regularly punctate; oblique impressions rather deep; margins narrow. *Scutellum* triangular, apex obtusely rounded, base entire. *Elytra* diminishing in width from base to apex, subhumeral lobes small, densely and moderately coarsely punctate, the punctures somewhat smaller but scarcely subseriately arranged posteriorly, towards base feebly transversely rugulose. Apex of *prosternum* wide and just perceptibly bilobed. Intermediate segments of abdomen strongly incurved to but continuous across middle.

Length 2½ mm.

♀. Differs in having the prothorax red, but with a complete transverse median fascia and a complete longitudinal vitta, the latter narrow on its apical and wide on its basal portion; the antennæ are shorter and the elytra are almost as wide at apex as at base; second and third abdominal segments with almost straight sutures, fourth rather large at sides but scarcely traceable across middle; fovea larger than usual, without lateral extensions.

Length 3 mm.

Hab. Tasmania: Huon River (*A. M. Lea*).

Of five specimens before me four are females, of these three have the prothoracic markings as described, in the other the prothorax is coloured exactly as in the male; on this and another female the front tibiæ have a blackish streak on their outer apex; the first and fifth joints of antennæ are dark in some specimens and pale in others.

This is another very small species which would look more at home in *Loxopleurus* but has the apex of the prosternum feebly bilobed. The prothoracic fascia with spurs, the apical segments of abdomen not pale flavous, and the colour of tarsi should distinguish it from *Lox. sturmi*, Chp.

Cryptocephalus tenebricosus, n. sp.

♀. Rather feebly shining. Blackish-brown; head (basal fourth excepted), antennæ (upper surface of first joint excepted), margins of elytra (the apex rather more widely than the sides), pygidium and legs (middle of femora and apex of tibiæ excepted) of a more or less obscure testaceous-red.

Head densely and coarsely punctate throughout, with a very feeble median impression. Antennæ rather thin, just passing hind coxæ, second joint more than half the length of third, third very little longer than fourth and slightly shorter than fifth, eleventh inserted towards side of tenth. *Prothorax* more than twice as wide as long; densely and coarsely punctate throughout; oblique impressions rather feeble, margins very narrow and entire. *Scutellum* rather strongly transverse, base entire and not much wider than apex; a few punctures towards base. *Elytra* oblong, subhumeral lobes rather small; coarsely and not very densely punctate; apical half with distinct costiform interstices. *Pygidium* with an indistinct median ridge. *Under-surface* densely and moderately coarsely punctate. Apex of prosternum wide and feebly bilobed. Abdomen with the fourth segment fairly large but in middle encroached upon by fovea, the latter wide, without lateral extensions.

Length $4\frac{3}{4}$ mm.

Hab. Queensland: Ipswich (types in Macleay Museum).

A dingy species with the apex of the prosternum feebly bilobed but which would look more at home in *Cadmus*. I was inclined at first to regard it as an extreme variety of *Cad. ornatus*, Chp. (which in build it much resembles), but apart from the prosternum and colour it differs in having the prothoracic margins decidedly narrower and the elytra more rugose.

Cryptocephalus distortus, n. sp.

(Plates XXV, XXVI, figs. 148, 192.)

♂. Elongate-oblong, feebly shining. Almost (parts of the under-surface quite) flavous; a triangle at base and parts of the front half of head, antennæ (base of second—fourth joints excepted), a triangle on prothorax (its base almost touching the apex of that segment) and extreme base, all the margins (including suture) of elytra very narrowly, scutellum, metasternum in parts, and legs (coxæ and base of tibiæ excepted) black.

Head densely and coarsely punctate; with a transverse and a

longitudinal impression. Antennæ long, passing apex of body, second joint less than one-third the length of third, third and fifth subequal and distinctly longer than fourth, fifth suddenly thickened at apex, seventh–tenth wide, the serrations of the joints reversed after the seventh, eighth largest of all, tenth obtusely curved at apex, eleventh strongly incurved at apex. *Prothorax* with large punctures of irregular size and irregularly distributed; oblique impressions feeble; margins narrow; each side at apex suddenly and rather deeply constricted so that the anterior angles project outwards. *Scutellum* transverse; with scattered punctures; base entire and not much wider than apex. *Elytra* elongate-oblong, subhumeral lobes very small; with fairly large punctures becoming seriate in arrangement and with irregularly convex interstices apically, elsewhere with transverse rugulosities. *Pygidium* very indistinctly ridged. Apex of *prosternum* wide and almost truncate. Intermediate segments of abdomen strongly incurved to middle, across which the fourth is just traceable, fifth of irregular shape with a deep transverse impression bounded by a ridge on each side; first with a transverse, tuberculiform, slightly bent elevation.

Length 5 mm.

Hab. QUEENSLAND: Brisbane (Macleay Museum).

The pygidium and parts of the abdomen are more or less deeply stained with brown. The transverse rugulosities extend much closer to the apex than usual, about the middle each extends almost across the entire width of the elytron.

This and the following species are allied to *Cr. bihamatus*, Chp., all three having very remarkable antennæ and abdomen in the males. The abdomen is very peculiar, the transverse tubercle of the first segment appears like a short, suddenly elevated, sloping carina; the apical impression (which is partially obscured at the base by long hairs belonging to the intermediate segments) is as large as the fovea in many females. In the male of *rufoterminalis*, n. sp., the tubercle is subacute, the fourth segment appears on each side as a triangular wedge and the impression on the fifth is large and subtriangular. In the male of *bihamatus*, the tubercle on the first segment is longitudinal and very distinctly bilobed at apex, the fourth segment appears as a wedge on each side (narrower than in the following species) and the apical impression is of a very irregular triangular shape. These three species form a very natural and highly interesting group.

Cryptocephalus rufoterminalis, n. sp.

(Plates XXIII, XXVI, figs. 70, 193.)

♂. Elongate-oblong, moderately shining. Black ; all the margins of prothorax, a rather wide antemedian fascia on elytra and portion of pygidium and under-surface flavous ; part of head, antennæ (eighth joint black and part of first seventh and ninth infuscate) and legs (upper portion of femora and third and part of fourth tarsal joints black) red ; apex of elytra orange-red.

Head densely and coarsely punctate ; with a narrow median impression. Antennæ longer than the body, second joint one-fifth the length of third, third slightly longer than fifth and much longer than fourth, fifth widened at apex, seventh—tenth wide and subtriangular, eighth widest, eleventh feebly curved. *Prothorax* more than twice as wide as long ; densely and coarsely punctate, punctures more or less round and very few confluent, margins narrow, anterior angles projecting outwards ; oblique impressions not traceable. *Scutellum* transverse ; feebly punctate ; base entire and but little wider than apex. *Elytra* of the same shape and sculpture as the preceding species, except that the transverse rugulosities are rather less regular. Apex of *prosternum* wide and feebly bilobed. Abdomen with a transverse rounded tubercle in middle of first segment, fourth appearing on each side as a triangular wedge, fifth with a triangular impression of which the apex is directed forwards.

Length 6 (vix) mm.

Hab. N. S. Wales : Uralla (*W. W. Froggatt*), Yass (Macleay Museum).

The specimen (damaged) from Yass has the entire tarsi and the apex of the tibiæ black. The dark portion of the under-surfaces varies in the two specimens before me, but in both the flanks of the metasternum are black and the intercoxal process of prosternum flavous. Both have some indistinct flavous patches about the base of the elytra. The abdominal impression although not very deep has almost perpendicular walls.

In colour of body this species agrees fairly well with Chapuis' description of *Cr. bihamatus*, but I have certainly correctly identified that species which has the antennæ almost entirely black and with the two terminal joints "*arcuatis, interius acute hamatis*," whilst in the present species the antennæ are almost entirely pallid and with the tenth joint not at all and the eleventh but feebly curved.

Cryptocephalus conspiciendus, n. sp.

(Plate XXIII, figs. 71, 72.)

♂. Elongate-oblong, moderately shining. Black; a transverse submedian spot on each elytron and base and apex of intercoxal process of prosternum flavous; coxæ and second—fourth joints of antennæ reddish. Pygidium and under-surface with silvery pubescence.

Head densely and coarsely punctate; eyes much closer together than usual. Antennæ long and thin considerably passing apex of body, second joint about one-third the length of third, third considerably longer than fourth and shorter than fifth. *Prothorax* not twice as wide as long, very coarsely and densely punctate, the punctures more or less confluent; margins very narrow but entire, anterior angles projecting outwards but invisible from above; oblique impressions not traceable. *Scutellum* subquadrate, apex but little narrower than base, with a large nasal notch. *Elytra* elongate-oblong, subhumeral lobes small; with very large (almost foveate) punctures, not much larger at base than elsewhere; with very irregular interstices (much interrupted by punctures) traceable (or at least the alternate ones) almost to base. Apex of *prosternum* wide and feebly bilobed. Abdomen with fourth segment just traceable across middle, fifth large.

Length $4\frac{3}{4}$ mm.

♀. Fourth abdominal segment rather large, middle depressed and encroached upon by fovea; the latter with narrow and (owing to clothing) indistinct lateral extensions.

Length 6 mm.

Hab. N. S. Wales (Macleay Museum), Jindabyne (*Bauerlin*), Sydney (*W. W. Froggatt* and *A. M. Lea*).

In two males before me the elytral spots are large outwardly and curved inwards to suture, along which each runs for a short distance, so that combined they form a very feeble V. In another male the spots are smaller and more distant from the suture; in a female they are also rather small and distant from the suture, in this specimen also the apex of the elytra is reddish. In the three males the prothorax has a slight greenish gloss.

In appearance the species somewhat approaches *Cad. luctuosus*, Chp., and *Cad. quadrifasciatus*, n. sp., but (apart from markings and apex of prosternum) punctures of both prothorax and elytra very different.

Cryptocephalus metallicus, n. sp.

♂. Metallic coppery purple ; antennæ red, the first joint black.*

Head densely and coarsely punctate ; with a very feeble median impression. Antennæ thin, second joint less than one-third the length of third, third and fifth subequal and longer than fourth, fifth slightly curved. *Prothorax* not twice as wide as long, very densely and coarsely punctate, the punctures all more or less confluent, margins very narrow and scarcely visibly crenulate, oblique impressions fairly large but indistinct. *Scutellum* subquadrate, densely punctate, apex not much narrower than base, base very deeply notched. *Elytra* oblong, subhumeral lobes small ; coarsely and very densely punctate ; apical half acutely costate. *Pygidium* very densely punctate, with a distinct median ridge. Apex of *prosternum* very wide, depressed, very feebly bilobed.

Length 4½ mm.

♀. Fourth segment of abdomen fairly large ; its middle distinctly encroached upon by fovea ; the latter with shallow lateral extensions.

Length 6 mm.

Hab. S. Australia : Victoria (types in Macleay Museum).

A very distinct species, in build and sculpture somewhat resembling *Cad. ornatus*, Chp. Pallid antennæ are most unusual for metallic species.

Cryptocephalus basizonis, n. sp.

(Plates XXIII, XXV, figs. 73, 170.)

♀. Pale reddish-testaceous, abdomen and pygidium flavous ; scutellum (its tip reddish), a wide basal fascia and a large subapical spot on each elytron black ; parts of metasternum, apex of femora and of tibiæ and the tarsi infuscate.

Head with rather small punctures, base strigose, with a distinct median impression. Antennæ thin, almost as long as the body, second joint one-third the length of third, third shorter than fifth. *Prothorax* not twice as wide as long ; impunctate except for a few small punctures at sides ; oblique impressions smooth and rather wide ; margins very narrow, sides dilated towards base and projecting outwards in front. *Scutellum* triangular, apex rounded and

* In the unique male the three terminal joints of the antennæ are missing, but from those left I imagine they slightly pass the body ; in the female they are slightly shorter than the body and most of the apical joint is black.

projecting, considerably above elytra, base deeply notched. *Elytra* widest near apex, subhumeral lobes small; with sparse minute punctures in almost regular series, but disappearing towards apex. *Pygidium* with a narrow and feeble median ridge. Apex of *prosternum* wide, feebly rounded and entire. Abdomen with the fourth segment large and feebly encroached upon by fovea; the latter with very shallow lateral extensions.

Length $8\frac{1}{2}$ mm.

Hab. QUEENSLAND: Cairns (type in Macleay Museum).

In general appearance a perfectly typical species of *Cryptocephalus*, although the apex of prosternum is not bilobed. Of the two specimens before me one has the antennæ entirely black, except for the second and base of the third and fourth joints, in the other only the apical and the upper portion of the basal joint is black. The pale portions of the elytra are paler than the prothorax. The punctures (except on the head) are sparser and smaller than in any other species with which I am acquainted.

CRYPTOCEPHALUS COMPTUS, n. sp.

(Plates XXIII, XXV, figs. 74, 75, 149.)

♂. Testaceous-red; apical half of antennæ, extreme base of prothorax, pygidium and metasternum infuscate; scutellum, tarsi and apex of tibiæ black; elytra with two black fasciæ not quite touching the sides, the first basal, the second and widest subapical, the two connected along suture.

Head with moderately large and not very dense punctures, base rather feebly strigose; with a median impression varying from deep and distinct to very faint. Antennæ rather thin, distinctly shorter than the body, second joint rather more than half the length of third, third distinctly shorter than fifth. *Prothorax* regularly convex, with fairly large but rather sparse and unevenly distributed punctures, oblique impressions feeble, margins rather narrow. *Scutellum* transverse, base notched and not much wider than apex. *Elytra* elongate-oblong, subhumeral lobes feeble, with rather large and dense punctures, becoming smaller and seriate in arrangement with feebly convex interstices posteriorly. Apex of *prosternum* obtusely rounded and entire. Abdomen with the fourth segment just traceable across middle.

Length 4 mm.

♀. Differs in having the antennæ shorter and thinner and the

punctures smaller; the fourth abdominal segment is narrow across middle; fovea almost without traces of lateral extensions.

Length $5\frac{1}{2}$—$6\frac{1}{4}$ mm.

Hab. S. Australia (Macleay Museum).

The scutellum varies from entirely (extreme base excepted) red to entirely black, the elytral markings have a greenish or bluish gloss. In the only male before me the base of the head and an irregular median prothoracic vitta are black, in one female these parts are also dark, but in six others both head and prothorax are of uniform colour. In several of the females only the third tarsal joint is black.

I have referred this and the following species to *Cryptocephalus*, although the apex of the prosternum is not bilobed, as they are typical-looking species of that genus. In build they much resemble *rubicundus*, n. sp. The markings of the present species are somewhat as in *Id. bynoci*, Saund., but the punctures, antennæ, scutellar notch, etc., are different and the body is rather more elongate. One specimen is marked as from the Western Interior of S. Australia.

Cryptocephalus minusculus, n. sp.

(Plate XXIII, figs. 76, 77, 78, 79, 80.)

♂. Testaceous-red; base of head, scutellum and metasternum black; elytra black with red markings, or red with black markings; apical portions of antennæ, abdomen (except at apex), tarsi, posterior femora and apex of tibiæ infuscate.

Length 3 (♀ $3\frac{3}{4}$) mm.

Much the build of the preceding species but the sexes always smaller, the punctures smaller and (especially on elytra) more numerous, the subhumeral lobes larger, the scutellum less transverse with the base considerably wider than the apex.

Hab. S. Australia (Macleay Museum).

This is a decidedly variable species. The head is entirely red in the female and sometimes in the male also, sometimes but two or three joints of the antennæ, at others all beyond the fourth are infuscate, sometimes all the femora are red whilst in others the hind or the four hind are infuscate, the scutellum is usually red but occasionally black, in some specimens the abdomen is entirely red. In some specimens the elytral markings (except that

the greenish gloss is absent) much resemble those on the preceding species; the following are some of them—

A Shoulders and a large subapical spot on each side black.
B The same but in addition with a triangular black space about the scutellum.
C Resembling *B* but with the basal markings united.
D Resembling *C* but with the apical spots united.
E Resembling *C* but with the basal and apical markings united along the sides.
F Elytra black, the apex, sides and a submedian spot (of variable size) on each, red.
G Resembling *F* but with the sides dark.
H Elytra entirely dark except for a small submedian spot (closer to suture than side) on each.

In eight specimens the prothorax is immaculate, in five others there is a short longitudinal vitta of variable size and shape.

Cryptocephalus T-viridis, n. sp.

(Plates XXIII, XXV, XXVI, figs. 81, 150, 151, 194.)

♂. Flavous or pale reddish-testaceous; head, a wide prothoracic fascia (having a median projection both in front and behind), scutellum, pygidium and under-surface black with a greenish gloss; elytra with the base, suture, shoulders and a longitudinal vitta on each side (feebly connected with shoulders or not) metallic green; antennæ (basal joints excepted) and tarsi infuscate. Pygidium and under-surface with silvery pubescence.

Head very densely and finely strigose, with small scattered punctures. Antennæ rather stout, just passing hind coxæ, second joint very little shorter than third, third slightly shorter than fourth, fourth slightly shorter than fifth. *Prothorax* with moderately dense but irregularly distributed punctures, fairly large at sides but small on disc, oblique impressions feeble, margins very narrow. *Scutellum* transverse, subtriangular, apex truncate, base notched. *Elytra* with small subhumeral lobes, densely (and in some specimens) coarsely punctate, punctures becoming smaller and subgeminate in arrangement posteriorly, with (in some specimens) feebly convex interstices. Apex of *prosternum* wide and almost truncate. Abdomen with the intermediate segments strongly incurved, the fourth not traceable across middle, fifth large.

Length 4¼ mm.

♀. Has the prothorax more transverse; the abdominal fovea large and deep and without lateral extensions.

Length 5¼ mm.

Hab. N. S. Wales (Macleay Museum).

I have referred this species to *Cryptocephalus* although the apex of the prosternum is not bilobed, as it would be absurd to refer it to any genus other than that to which *Cr. parenthecticus*, Suff., belongs; at first sight indeed it appears to be but a variety of that species, but the antennæ, prothoracic punctures and apex of prosternum are somewhat different. The colour (except for slight variations on the prothorax and sides of elytra) appears to be constant in the five specimens before me; the legs are pallid whilst in *parenthecticus* they are invariably black. The green parts of the elytra (leaving the lateral vittæ out) somewhat resemble the letter T, the sutural marking being very narrow at apex, slightly widening out to middle and then rapidly increasing in width to the shoulders. The size and density of the punctures are subject to considerable variation and are usually smaller in the female than in the male. The comparative lengths of the second —fourth joints of antennæ are rather unusual. In the female as well as in the male the fourth abdominal segment is not traceable across the middle.

Cryptocephalus serenus, n. sp.

♀. Almost (abdomen quite) flavous; suture dark metallic bluish-green, the green extended round scutellum (the extreme base of which is almost dark) and at base very narrowly continued almost to the sides; upper surface of first and the three terminal joints of antennæ infuscate; tips of claws black.

Head with dense but rather small punctures, with a wide indistinct median impression. Antennæ just passing hind coxæ, second joint half the length of third, third slightly longer than fifth and distinctly longer than fourth. *Prothorax* about thrice as wide as long; with moderately dense and fairly large punctures (larger at sides than elsewhere) and with numerous minute scattered punctures; oblique impressions irregular and indistinct; margins finely crenulate. *Scutellum* feebly transverse, base entire and very little wider than apex. *Elytra* oblong, subhumeral lobes feeble; not very densely or coarsely punctate, the punctures denser and larger below shoulders than elsewhere, subgeminate about middle and seriate, with feebly convex interstices, posteriorly; with minute scattered punctures.

Apex of *prosternum* very wide and obtusely rounded. Abdomen with the fourth segment just traceable across middle; fovea with scarcely traceable lateral extensions.

Length 5½ mm.

Hab. W. Australia: Geraldton (*A. M. Lea*).

A pallid species but rendered distinct by the dark green and fairly wide sutural marking. I have seen but one specimen.

Cryptocephalus scabiosus, n. sp.

(Plate XXIII, fig. 82.)

♀. Oblong, moderately shining, subtuberculate. Of a rather dark red, antennæ and tarsi paler; junction of prothorax with scutellum and elytra and apex of scutellum blackish; elytra with a submedian flavous fascia.

Head densely and coarsely punctate and with a distinct median impression. Antennæ thin, not extending to hind coxæ, second joint more than half the length of third, third distinctly longer than fourth, fourth and fifth subequal. *Prothorax* densely and coarsely punctate, punctures very irregular; oblique impressions feeble, margins very narrow. *Scutellum* transverse; feebly punctate; base deeply notched and less than twice the width of apex. *Elytra* oblong, subhumeral lobes small; rather coarsely and very irregularly punctate; with scar-like elevations—largest across middle and towards base and apex more or less following the lines of interstices. Apex of *prosternum* very wide and distinctly bilobed. Abdomen with the fourth segment just traceable across middle; fovea without lateral extensions.

Length 5½ mm.

Hab. S. Australia (types in Macleay Museum).

A peculiar and roughly sculptured species totally different to any other known to me. The flavous fascia on the elytra is very irregular and is confined to the elevated portions.

There are two females before me; a male, which I believe to belong to the species, is deep black (the head, antennæ and parts of the legs piceous-brown), with a very distinct but irregular pale elytral fascia, interrupted at suture, and on each side enclosing two small irregular dark circular spaces; from the fascia there are no prolongations either backwards or forwards, but on both the females there are such. This male is also of smaller size (3¾ mm.), with coarser punctures, prothorax more gibbous

and less transverse, scutellum larger and scar-like elevations on middle of elytra more pronounced. Its abdomen is most remarkable, in that the second, third and fourth segments are not at all visible across the middle, so that there the first actually appears to impinge on the fifth; the latter is large, flattened in the middle and with a rather indistinct transverse impression.

Cryptocephalus incoctus, n. sp.

♂. Briefly oblong-ovate, moderately shining, pubescent, rough. Head (front excepted), prothorax (extreme apex and sides excepted) and extreme base of elytra and of scutellum black; elytra almost scarlet; pygidium and under-surface reddish-testaceous, appendages paler; metasternum and apical joint of antennæ infuscate. Moderately densely (the elytra sparsely) clothed with short golden pubescence.

Head densely and coarsely punctate; with a rather deep median impression. Antennæ thin, longer than the body, second joint about one-third the length of third, third slightly shorter than fifth. *Prothorax* not much more than once and one half as wide as long, disc obsoletely bituberculate, oblique impressions wide but indistinct, margins narrow and feebly crenulate; coarsely and very densely punctate, the punctures partially concealed by clothing. *Scutellum* longer than wide; densely punctate; apex about half the width of base, base notched, acutely ridged along middle. *Elytra* subquadrate, feebly diminishing in width from base to apex, subhumeral lobes large; densely and coarsely punctate, with convex interstices somewhat irregular posteriorly but very irregular towards base. *Under-surface* densely and moderately coarsely punctate. Apex of prosternum wide and very distinctly bilobed. Intermediate segments of abdomen strongly incurved to and narrow across middle, fifth large with a large and not very shallow median impression.

Length 5¼ mm.

♀. Differs in being of a rather dingy red, the elytra somewhat paler than the prothorax, but with the junction of these blackish, the apical joint no darker than the others, or dark only on its apical half and the metasternum is no darker than the abdomen. It is larger, with smaller punctures, eyes much more distant, antennæ just passing hind coxæ, prothorax without feeble tubercles, and elytra fully as wide at apex as at base. Intermediate segments of abdomen large and almost straight, the fourth slightly wider than the third; fovea without lateral extensions.

Length 6½ mm.

Hab. QUEENSLAND: Mackay (*C. French*).

A short broad species at first sight apparently belonging to *Lachnabothra*, and possibly really an aberrant member of that genus; but I have placed it here amongst other aberrant species as being less likely to cause confusion. There are four females before me, in one of which the elytra are almost as brightly coloured as in the unique male.

CRYPTOCEPHALUS COMOSUS, n. sp.

♀. Elliptic-oblong, opaque. Black; elytra (extreme base and shoulders excepted) pale testaceous; basal joints of antennæ obscurely diluted with red. Densely and uniformly clothed with short pubescence — golden on the upper, silvery on the lower surface.

Head and prothorax with rather small but very dense and regular punctures. Antennæ long and thin, passing apex of body, second joint about one-third the length of third, third distinctly shorter than fifth. *Prothorax* with the oblique impressions indistinct but fairly deep, margins narrow. *Scutellum* as long as wide; densely punctate; ridged along middle, base not very much wider than apex, and with a rather large notch. *Elytra* oblong, subhumeral lobes small; with regular series of punctures from base to apex; interstices wide, feebly convex, and densely and finely punctate. *Pygidium* strongly bilobed at apex. Apex of *prosternum* very wide and truncate, but in middle with a scarcely perceptible notch. Abdomen with second and third segments large, fourth very decidedly trisinuate at apex; fovea without lateral extensions.

Length 6¼ mm.

Hab. QUEENSLAND: Tambourine (type in *R. Illidge's* collection).

A very distinct species having pallid and densely pubescent elytra, strongly bilobed pygidium and the fourth abdominal segment trisinuate. Its only previously described hairy congener from Australia is *Cr. hispidus*, Chp. (unknown to me), which has blackish-blue elytra and pallid abdomen and pygidium.

CRYPTOCEPHALUS CONVEXICOLLIS, n. sp.

(Plate XXVI, fig. 195.)

♂. Elongate elliptic-oblong, highly polished. Of a fiery metallic copper colour, suture and under-surface with a greenish gloss, antennæ black.

Head with moderately large sparse punctures, but densely strigose at base; middle feebly impressed. Antennæ stout, just passing hind coxæ, second joint more than half the length of third, third and fifth subequal, seventh—tenth rather wide. *Prothorax* less than twice as wide as long, strongly and regularly convex, oblique impressions almost absent; margins very narrow; sides with dense and moderately large punctures, becoming smaller and sparser on disc; minute punctures scattered about. *Scutellum* slightly transverse; sparsely punctate; base not much wider than apex and with a large notch. *Elytra* with small subhumeral lobes, coarsely punctate behind shoulders, apical half with small punctures in regular series, towards base becoming larger and subgeminate in arrangement. *Pygidium* with a very feeble median ridge. Apex of *prosternum* wide and just perceptibly bilobed. Intermediate segments of abdomen strongly incurved to and narrow across middle, fifth large and feebly transversely depressed.

Length 4½ mm.

♀. Differs in being slightly larger with smaller punctures and antennæ shorter and thinner; fourth abdominal segment just traceable across middle; fovea without lateral extensions.

Length 5 mm.

Hab. N. S. Wales: Berrima (types in Macleay Museum), Bungendore, Queanbeyan (*A. M. Lea*).

An aberrant species with an outline suggestive of *Prasonotus*, but the scutellum of normal size and the intercostal process of prosternum of different shape to that of *P. submetallicus*, Suffr., and *rufieaudis*, Baly. I have seen but one male, but there are four females before me; of these two are coloured as the male, the third is deep metallic blue with purplish reflections, and the fourth is metallic green, with in places, and from some directions, coppery reflections.

Cryptocephalus ornatipennis, n. sp.

(Plate XXIII, figs. 83, 84.)

♂. Bluish-black; front of head, extreme apex and sides of prothorax and parts of four (or of a less number) basal joints of antennæ dull red; under-surface (metasternum infuscate) and legs (tarsi and apex of tibiæ blackish) paler; elytra with the base (but not the extreme base) and four postmedian and two subapical spots flavous.

Head densely and regularly punctate except that at base the punctures become subconfluent; median impression feeble. Antennæ

moderately stout, just about the length of body, second joint less than half the length of third, third slightly shorter than fifth. *Prothorax* more than twice as wide as long; with dense, round, regular punctures of fairly large size, but sparser on disc (where a few smaller punctures are scattered about) than elsewhere; oblique impressions fairly deep, but interrupted in middle, margins not very narrow. *Scutellum* transverse; sparsely punctate; apex wide, base deeply notched. *Elytra* oblong, sublumeral lobes small; with large dense punctures (very sparse on the pallid portions), becoming sparser, smaller (but still rather large), and seriate in arrangement posteriorly. Apex of *prosternum* wide rounded and entire. Intermediate segments of abdomen rather strongly incurved to middle.

Length 5½ mm.

♀. Differs in having the upper surface of a purplish-red (except that the junction of the prothorax with the scutellum and elytra is black), and the legs (tips of the claws excepted) entirely pale; the elytral markings are, however, the same. It is larger and wider, punctures smaller, antennæ thinner, and just passing hind coxæ, and both the prothorax and scutellum more transverse. Abdomen with second and third segments large and with almost straight sutures, fourth encroached upon by fovea; the latter with very shallow lateral extensions. Length 7½ mm.

Hab. N. Queensland: (*R. Illidge*), Endeavour River, Thursday Island (Macleay Museum).

An aberrant species and, like the last, with an outline suggestive of *Prasonotus*. It appears to be an abundant species in North Queensland. The four postmedian spots (which appear as parts of a fascia) are sometimes united to form but two. One peculiarity of the species is the fact that the punctures are very sparse (on some specimens they are altogether absent) on the pallid portions of the elytra; those that do occur there are more or less infuscate.

Cryptocephalus cœlestis, n. sp.

(Plate XXVI, fig. 196.)

♀. Deep metallic blue with purplish reflections; under-surface (flanks of prosternum and two apical segments metallic blue), coxæ and base of femora reddish.

Head densely punctate, strigose at base and sides of eyes. Antennæ very wide, slightly shorter than the body, second joint transverse, about one-third the length of third, third slightly shorter and narrower than fourth, fifth much the widest and longest, sixth—tenth

transverse, sixth about half the length of fifth, the others gradually decreasing in length, eleventh obpyriform. *Prothorax* much wider at base than at apex; oblique impressions deep and narrow; with rather large irregular punctures and with transverse rugulosities, punctures denser at sides than elsewhere; margins narrow. *Scutellum* triangular, longer than wide, base notched. *Elytra* briefly oblong, subhumeral lobes not very small; densely but not very coarsely punctate, and feebly transversely rugulose, posteriorly punctures becoming smaller and irregularly geminate in arrangement almost to the apex. *Pygidium* with rather larger punctures than usual. Apex of *prosternum* very wide, feebly rounded and entire. Abdomen with the fourth segment small and moderately incurved to middle, fifth comparatively small; fovea with irregular extensions.

Length $4\frac{3}{4}$ mm.

Hab. Victoria: Gisborne (type in *H. H. D. Griffith's* collection).

A very beautiful and decidedly aberrant species.

Of the species of the subfamily described as having antennæ very wide in the middle, *Chariderma pulchella*, Baly, has the prothorax and elytra maculate and the prosternum much as in *Schizosternus*; *Aporocera apicalis*, Saund., and *bicolor*, Saund., have the prothorax pallid and the elytra long with large punctures in regular series. *Ap. chalybea*, Saund. (unknown to me), is described as having the prothorax pitchy-black margined with ochraceous, the legs differently sculptured and the elytral sculpture different. The following species has also antennæ very wide in the middle, but its sculpture and colour are very different and the intercostal process is strongly ridged along the middle.

Cryptocephalus costipennis, n. sp.

(Plates XXV, XXVI, figs. 171, 197.)

♀. Moderately shining. Black; muzzle, coxæ and extreme base of tibiæ dull red; prothorax and elytra testaceous, the former with the sides in front and a median line (not quite continuous to apex), the latter with the basal third of the sides and the suture, black.

Head opaque and densely and coarsely punctate. Antennæ wide, just passing hind coxæ, second joint less than half the length of third, third—fifth very wide, the third slightly the widest, the fifth slightly the longest, sixth—tenth regularly diminishing in length and width, eleventh slightly longer and narrower than tenth, apex

triangularly pointed. Prothorax more than twice as wide as long; coarsely and very densely punctate; margins narrow and entire. *Scutellum* moderately convex, coarsely punctate, base feebly notched and not much wider than apex. *Elytra* elongate, subhumeral lobes very small; with very dense, round, moderately large, regularly distributed punctures; each elytron with four very distinct and strongly elevated costæ, of which the outer (commencing just below the shoulder) is the largest and becomes united to the sutural one close to apex, the second from the suture commences closer to the base and is larger than the third, but terminates before it. *Pygidium* densely and rather coarsely punctate. *Under-surface* with dense punctures, many of those on abdomen transverse. Prosternum very decidedly ridged along middle, apex rounded and entire. Abdomen with larger segments (except the fifth which is smaller) than usual; fovea without lateral extensions.

Length 7½ mm.

Hab. N. S. Wales: Jenolan (*J. C. Wiburd*).

The dark sutural marking is very narrow at the base and gradually becomes wider (although it is nowhere very wide) towards apex, on the apex itself being slightly extended. In addition to the four distinct costæ on each elytra, there are traces of others both towards base and apex. The intercoxal process of prosternum very distinctly produced and rounded at the hinder apex and strongly ridged along middle, with the shape of the antennæ, decidedly distinguish this from the normal species of *Cryptocephalus*.

Diandichus foveiventris, n. sp.

♂. Oblong-obovate, moderately shining. Head, prothorax, scutellum, antennæ (the basal joints obscurely diluted with testaceous), tarsi, hind femora, part of middle femora and the apices of tibiæ (the hind more than the front), black; rest of appendages and the gular regions testaceous; elytra deep bluish-green.

Upper-surface very densely and finely punctate throughout, prothorax with moderately large and rather dense punctures, smaller on disc than elsewhere; elytra with rather dense punctures on basal third, becoming smaller, sparser, and subseriate in arrangement posteriorly. *Head* with or without a feeble median impression; a small fovea on each side of the clypeus. Antennæ slightly longer than the body, second joint more than half the length of third. *Prothorax* about twice as wide as long, a rather shallow oblique impression on each side. *Scutellum* very long and thin; impunctate.

Elytra at base very little wider than prothorax, each widely rounded at apex. *Abdomen* with the fourth segment not traceable across middle, the fifth semicircular in front.

Length 2½ mm.

♀. Differs in being larger, with the antennæ somewhat shorter than the body and the basal joint of all the tarsi narrower. The apical fovea is very large, occupying more than one-third the width of the segment and is without lateral extensions; the abdomen (except the middle of the two basal segments) and the pygidium are flavous, and the middle legs entirely black; the elytra are more dilated towards the apex than in the male.

Length 2½–3 mm.

Hab. W. Australia: Geraldton (*A. M. Lea*).

In some females the elytra are more bluish (occasionally with a slight purplish gloss) than green. The prothorax black in both sexes easily distinguishes this species from *analis*, Chp. (the only previously described species); the punctures of the upper-surface are also different and the antennæ are thinner in both sexes.

Schizosternus delicatulus, n. sp.

(Plate XXV, fig. 176.)

♀. Of a clear pale red; antennæ (second joint sometimes excepted), tarsi, tips of tibiæ and of mandibles and extreme base of scutellum and elytra black or blackish.

Head moderately densely and rather coarsely punctate, punctures sparser along middle than elsewhere; vertex with a median impression. Antennæ extending to hind coxæ, second joint more than half the length of third. *Prothorax* not twice as wide as long, sides near apex suddenly and deeply constricted so that the anterior angles project outwards; with sparse and moderately large punctures irregularly distributed; oblique impressions very feeble. *Scutellum* quadrate; impunctate; gently convex, base deeply notched. *Elytra* with rather small subhumeral lobes; moderately strongly punctate, the punctures in regular series almost from the base, becoming smaller posteriorly. Apex of *prosternum* semicircularly excised, the projecting points rather blunt. Fourth segment of abdomen just perceptible across middle, apical fovea large and deep, without lateral extensions.

Length 4½ mm.

♂. Unknown.

Hab. Queensland: Gayndah, Rockhampton (Macleay Museum).

In build much the same as *S. coccineus*, Chp., but (apart from colour) readily distinguished by its shorter and more quadrate scutellum, with the basal notch deeper; the punctures on the head are also very different. In the three specimens before me the punctures on the prothorax vary considerably in number, on one specimen being very sparse, on another fairly numerous, but they appear to be always sparser on the disc than elsewhere.

Schizosternus trilineatus, n. sp.

(Plate XXIV, fig. 85.)

♀. Head (base black) and prothorax testaceous, elytra (extreme base and three stripes black) and legs (tarsi and apices of tibiæ black) somewhat paler, intercoxal process and abdomen flavous; antennæ black; metasternum blackish, in parts testaceous.

Head densely and coarsely punctate. Antennæ thin, second joint less than half the length of third. *Prothorax* not once and one-half as wide as long; sides near apex suddenly and deeply constricted so that the anterior angles project outwards; with moderately large irregularly distributed punctures; disc somewhat gibbous; oblique impressions feeble. *Scutellum* subquadrate. *Elytra* rather long and parallel-sided, subhumeral lobes small; rather densely and coarsely punctate, the punctures becoming subseriate in arrangement posteriorly. *Pygidium* densely and rather finely punctate, and with a feeble median ridge. Apex of *prosternum* triangularly excised. Fourth segment of abdomen hidden in middle; apical fovea large, deep, and without lateral extensions.

Length 4 mm.

Hab. N. S. Wales (type in Macleay Museum).

The three dark elytral stripes are parallel-sided, but at the apex they become conjoined, the sutural is narrower than the lateral ones; the subhumeral lobes are coloured as the disc. In the type the two terminal joints of the antennæ are missing.

Schizosternus marmoratus, n. sp.

(Plates XXIV, XXV, figs. 86, 128, 172.)

♀. Flavous; under-surface and legs obscurely mottled with brown; antennæ testaceous; head with the vertex and a median line brown; prothorax and elytra with chocolate-brown or purplish markings; base of scutellum and of elytra narrowly black. Flanks of abdomen and of metasternum and the pygidium rather densely pubescent.

Head moderately densely but not very coarsely punctate; with a deep median impression. Antennæ passing hind coxæ, second joint less than half the length of third. *Prothorax* about twice as wide as long, sides strongly narrowed in front, but not suddenly constricted, with moderately large and not very dense punctures, the interspaces with sparse minute punctures; oblique impressions almost absent. *Scutellum* quadrate, the base scarcely visibly notched. *Elytra* with rather small subhumeral lobes; with large punctures irregularly distributed and smaller on hind than on front half. *Pygidium* feebly carinate. Apex of *prosternum* triangularly excised, the projecting points acute. Fourth segment of abdomen hidden across middle; apical fovea large and deep, with shallow lateral extensions.

Length 6 mm.

Hab. S. AUSTRALIA (type in Macleay Museum).

This is one of the finest species in the subfamily. On the prothorax the markings are somewhat as in *Cadmus aurantiacus*, Chp., and on the type are seven in number; on the elytra all the punctures are stained with the stains often conjoined in irregularly curved lines, there are three principal masses on each elytron—two sub-basal (one scutellar, the other humeral with the shoulder itself stained although not punctate) and one subapical; these masses are different on each elytron.

SCHIZOSTERNUS CRASSICORNIS, Chp.

(Plates XXIV, XXV, figs. 87, 88, 129, 130, 131, 173.)

♂. Of a rather pale testaceous; vertex and a short median line on head, a rather wide median line and an elongate spot between it and sides on prothorax, scutellum, suture and extreme base of elytra (as also of prothorax), black; under-surface and legs black in places, part of basal and part of apical joints of antennæ black.

Head rather densely and coarsely punctate, vertex longitudinally impressed. Antennæ stout, almost extending to apex of body, second joint transverse, less than half the length of third, fourth almost as long as fifth, seventh—eleventh gradually decreasing in length and thickness. *Prothorax* about twice as wide as long, sides strongly lessened in front but not suddenly constricted; densely and coarsely punctate, especially on the sides. *Scutellum* subquadrate, smooth and flat; with a few small punctures; apex feebly rounded, base gently emarginate. *Elytra* widest near base, with very feeble subhumeral lobes; with moderately large punctures, more or less regular in arrangement towards the base, and regular with convex

interstices posteriorly. Apex of *prosternum* rather widely triangularly excised.

Length 5 mm.

♀. Differs in being larger with the antennæ much shorter and thinner and the second joint not at all transverse; the head is smoother with smaller punctures and the median line less deeply impressed; the fourth segment of the abdomen is hidden across the middle; apical fovea large and deep, with feeble lateral extensions.

Length 6–7 mm.

Hab. W. Australia: Geraldton, Vasse (*A. M. Lea*).

The colour of the under-surface and legs (independently of sex) varies greatly, in some specimens these parts are almost entirely testaceous, in others they are almost entirely deep black; in one specimen the antennæ (except for parts of the second, third and fourth joints) are entirely black, in this specimen also (a ♀) the dark facial line is connected with the antennæ so as to appear something like a Y, its prothorax is blackish, with the sides and several obscure discal spots testaceous, the sutural marking instead of being narrow and confined to the suture itself gradually widens out so that near the apex (but not at the apex itself) it covers about four interstices on each. In several specimens the middle of the scutellum is pallid. The middle of the apex of the prothorax is sometimes black. The dark median line of the prothorax varies considerably in width, the spot on each side is sometimes distinct and fairly large, sometimes small and obscure, and occasionally absent. The elytral punctures frequently have a watery appearance so that (to the naked eye) they appear much larger than they really are. The elytral punctures are not alike in any two of the six specimens before me, on two of them only they are very decidedly geminate in arrangement, on one specimen they are much sparser and larger at the base than in the others. From each shoulder almost to the apex there is a distinct lateral ridge, but this is invisible from above.

I drew up the description of this species as new, but subsequently came to the conclusion that it was really *Cryptocephalus crassicornis*, Chp., of which an unique male only (and without exact locality) was known to Chapuis.

Loxopleurus lateriflavus, n. sp.

(Plate XXIV, fig. 89.)

♂. Head (basal half black with a greenish gloss), prothorax (the sides paler), legs (tarsi black, apex of tibiæ blackish) and metasternum pale flavous-red; rest of under-surface flavous; scutellum and antennæ black; elytra bright metallic green with wide flavous margins.

Head densely and moderately coarsely punctate; very feebly longitudinally impressed. Antennæ about as long as the body, second joint half the length of third, third slightly shorter than fifth. *Prothorax* more than twice as wide as long; densely and coarsely punctate; towards base with traces of a feeble median carina; oblique impressions rather deep; margins wide. *Scutellum* triangular, base entire. *Elytra* oblong, sides almost perfectly parallel, subhumeral lobes small; densely and moderately coarsely punctate, punctures somewhat smaller but not at all seriate in arrangement posteriorly. Apex of *prosternum* rounded and slightly produced in middle. Abdomen with fourth segment just traceable across middle.

Length $2\frac{3}{4}$ mm.

♀. Differs in having the two apical joints of tarsi infuscate only, with the basal joints and the apex of tibiæ but little darker than the rest of the legs, and the two basal joints of antennæ obscurely reddish below. Antennæ thinner and shorter than the body. Abdomen with fourth segment not traceable across middle; fovea large.

Length $3\frac{1}{2}$ mm.

Hab. W. Australia: (Macleay Museum) Swan River, Karridale (*A. M. Lea*).

A very beautiful species somewhat resembling *Cr. tricolor*, Fab., and *consors*, Boi., but the wide and continuous pallid elytral margins will readily distinguish it from either, it has also much coarser punctures than either. *Tricolor* (which is almost its exact size) has unicolorous elytra; *consors* (which is considerably larger but has the elytral margins partly pallid) has the prothorax maculate. In the present species the pallid margins are continuous and of almost equal width throughout, except that at the base and suture they are slightly narrower.

Loxopleurus pallidipes, n. sp.

♀. Of a rather dark metallic green; under-surface black with a greenish gloss, appendages and mouth parts reddish-testaceous, apical joint of antennæ infuscate.

Head densely punctate and strigose at base and sides of eyes, shining and feebly punctate elsewhere. Antennæ thin, scarcely passing hind coxæ, second joint half the length of third, third slightly shorter than fifth. *Prothorax* with sides densely and moderately coarsely punctate, elsewhere with rather small punctures; oblique impressions distinct and rather deep; margins extremely narrow. *Scutellum* triangular, base entire. *Elytra* oblong, subhumeral lobes rather large; densely and coarsely punctate, punctures subgeminate in arrangement about middle, posteriorly becoming seriate with regularly convex interstices. *Under-surface* densely punctate. Apex of prosternum subtriangular. Fovea large slightly encroaching on fourth segment.

Length 3½ mm.

Hab. W. Australia: Geraldton, Swan River (*A. M. Lea*).

In one of the two specimens before me the hind femora are blackish. The reflexed margins of the prothorax are so extremely narrow that it is only from certain directions that they can be seen.

In build and colour this species somewhat resembles the one I have doubtfully identified as *Lox. subvirens*, Chp., but is at once to be distinguished from it by its pallid legs.

Loxopleurus lugubris, n. sp.

(Plate XXV, fig. 132.)

♂. Black, with or without a greenish gloss; sides of prothorax narrowly obscure red, the red sometimes occupying a fairly large space at the posterior angles; elytra dark metallic green (or blue); legs testaceous, tarsi and apex of tibiæ black or infuscate; antennæ blackish, a varying number of the basal joints more or less red.

Head densely but not very coarsely punctate, strigose at base and sides of eyes. Antennæ as long as body, second joint half the length of third, third slightly shorter than fifth. *Prothorax* scarcely twice as wide as long, rather strongly gibbous in front; coarsely and very densely punctate; oblique impressions rather deep; margins very narrow. *Scutellum* triangular, base scarcely visibly notched. *Elytra* briefly oblong, subhumeral lobes very small; densely and rather coarsely punctate throughout, but punctures rather sparser and with

feeble traces of a linear arrangement posteriorly. *Under-surface* densely punctate. Apex of prosternum subtriangular. Intermediate segments of abdomen strongly incurved to and narrow across middle.

Length 2¼–2½ mm.

Hab. N. S. Wales: Kiama (Macleay Museum), Sydney, Forest Reefs (*A. M. Lea*).

In one specimen the prothorax has only the extreme sides dull red, in others the red occupies a much greater space, and it usually covers a fairly large space at the posterior angles. Sometimes more, at others less than half of the tibiæ are infuscate, in some specimens these are entirely pallid, occasionally the femora are stained with piceous.

Appears to be close to *Lox. gibbus*, Chp., but that species was described from a female, and the only females I have seen (see below) are much larger (I have seen no male even as small as 2 mm.) and the colour is usually very different. The colours of the legs, however, and especially of the femora, are liable to variation in both sexes. I certainly think this species is not *gibbus*, although, had the specimen described by Chapuis been a male, I should have had little doubt in so considering it. *Lox. obtusus*, Chp., which is allied to this species, has the prothorax entirely dark in the male.

Although there are numerous males of this species before me I am by no means certain that I know the female; I have, however, numerous females (also from Forest Reefs and Sydney) which I have always considered as belonging to the species. They differ in being larger (3–3½ mm.) and somewhat stouter, the prothorax of a rather dingy red (the apex usually clouded with black, but in some specimens the black considerably extended over the disc, and in one leaving only a rather narrow margin on each side red—much as in the males); the elytra are uniformly dark metallic green (except that, in one specimen only, the base has a purplish gloss); the antennæ are considerably shorter than the body, the third and fourth abdominal segments are very narrow across the middle and the fovea is fairly large.

These females are close to *Lox. piceitarsis*, Chp., but have coarser punctures, lower part of head always black and body decidedly shorter, apex of tibiæ as well as tarsi dark, and prothorax often partly dark, etc.

Loxopleurus mixtus, n. sp.

(Plate XXIV, fig. 90.)

♂. Black with a coppery gloss; prothorax and muzzle red, tibiæ and parts of the basal joints of antennæ obscure red.

Head densely coarsely and regularly punctate. Antennæ slightly shorter than the body, second joint half the length of third, third slightly shorter than fifth. *Prothorax* more than twice as wide as long; with rather large but somewhat irregularly distributed punctures; oblique impressions feeble; margins narrow. *Scutellum* triangular, base feebly notched. *Elytra* oblong, subhumeral lobes very small, densely but not coarsely punctate, punctures posteriorly becoming smaller and seriate in arrangement, about the middle subgeminate. Apex of *prosternum* obtusely produced.

Length 3 (vix) mm.

♀. Differs in being entirely pallid except at the junction of prothorax, elytra and scutellum, and for a dark greenish stain about the scutellum. It is much larger, antennæ thinner and shorter and the elytral punctures sparser and smaller. Abdomen with the fourth segment narrow across middle; fovea large and comparatively shallow.

Length 3½–4 mm.

Hab. W. Australia: King George's Sound (types in Macleay Museum), Karridale, Vasse, Swan River, Geraldton (*A. M. Lea*).

The two specimens described were mated as male and female by Mr. Masters, and were probably taken *in cop.* by him. The female has the abdomen no paler than the metasternum, but this may be due to its age, as in six specimens taken recently it is flavous. Two specimens before me have the middle of the sterna black, in one of these the scutellum is entirely black, in the other the base of the head is black with a greenish gloss; in another specimen the middle of the pro- and mesosternum are black, whilst the dark space about the scutellum is triangular and produced almost to the middle. The apical half of the antennæ in the female is usually dark. I have seen but one other male, and which agrees closely with the type.

In appearance the male (except that it is smaller and has shorter antennæ) resembles the male of *castor*, n. sp., *pollux*, n. sp., and to a less extent of *Lox. piceitarsis*, Chp. The female much resembles the following species and the female of *Id. subbrunnea*, Saund., and *Cr. serenus*, n. sp.

The female agrees very well with Chapuis' description of *Lox. æneolus*, but as he described the sexes of that species as similar in colour and size, and as in this species the male is very different to the female in size and has the elytra entirely dark, I cannot but think it a different species; more especially when the thousands of miles separating the locality of *æneolus* (Pine Mountain in Queensland) and the coastal districts of Western Australia are taken into consideration.

Loxopleurus acentetus, n. sp.

♂. Reddish-testaceous; base of head, scutellum, junction of prothorax and elytra, metasternum and eight terminal joints of antennæ black or blackish.

Head densely punctate and strigose, with a distinct median impression. Antennæ about as long as body, second joint half the length of third, third slightly shorter than fourth and distinctly shorter than fifth. *Prothorax* densely and coarsely punctate, punctures rather sparser on disc than elsewhere; oblique impressions large and continuous across base; margins narrow. *Scutellum* transverse, subtriangular base feebly notched. *Elytra* oblong, subhumeral lobes small, moderately densely and rather coarsely punctate, punctures becoming subseriate in arrangement posteriorly; with traces of feeble longitudinal elevations. Apex of *prosternum* obtusely rounded. Intermediate segments of abdomen strongly incurved to and very narrow across middle.

Length 3¼ mm.

♀. Has the antennæ thinner and just passing hind coxæ; fourth abdominal segment not traceable across middle and fovea larger than usual.

Length 4 mm.

Hab. Tasmania: Huon River (on young leaves of *Eucalyptus*, *A. M. Lea*).

In the female the colour is usually the same as in the male, but occasionally the base of the head and the fourth joint of antennæ are diluted with red, whilst the fourth joint is dark above.

In appearance rather close to *Id. subbrunea*, Saund., of which I only know the female, but the female larger, more coarsely punctate, elytra longer, antennæ stouter and darker and the tibiæ and tarsi considerably stouter. *Lox. verticalis*, Chp. (described from a female and without exact locality), is stated to have the scutellum semi-elliptic and

flavous and the elytral punctures infuscate, whilst the whole of its under-surface is apparently flavous.

Loxopleurus castor, n. sp.

(Plate XXVI, fig. 198.)

♂. Black, with or without a slight bluish gloss ; prothorax red ; muzzle, second—fourth joints of antennæ and base of tibiæ of a more or less obscure red.

Head densely punctate and strigose, median impression fairly distinct. Antennæ distinctly shorter than the body, second joint half the length of third, third shorter than fifth. *Prothorax* moderately densely and coarsely punctate ; disc with smaller and sparser punctures than elsewhere ; oblique impressions deep but short ; margins narrow. *Scutellum* triangular, base distinctly notched. *Elytra* oblong, subhumeral lobes small ; densely and coarsely punctate, punctures posteriorly becoming subseriate in arrangement, with irregularly convex interstices. Apex of *prosternum* obtusely rounded.

Length 3½ mm.

♀. Antennæ just passing hind coxæ ; abdomen with fourth segment just traceable across middle and slightly encroached upon by fovea.

Length 4½ mm.

Hab. S. Australia ; W. Australia : Swan River (Macleay Museum).

In appearance, except that the apex of the elytra is not red, similar to the male of *Cr. jocosus*, Chp.

Loxopleurus pollux, n. sp.

(Plate XXVI, fig. 199.)

♂. ♀. In appearance very close to the preceding except that the antennæ are thinner, those of the ♂ distinctly longer than the body, and in the ♀ extend fully to the apex of the second abdominal segment with the second joint less than half the length of third and third distinctly longer (instead of shorter) than fifth ; the punctures of both head and elytra are denser, and the head is not distinctly strigose. Colours are as in the preceding except that the antennæ are entirely dark and the coxæ reddish.

Length ♂ 3¼ ; ♀ 4¾ mm.

Hab. Tasmania : Karoola (*A. Simson*), Frankford, Huon River, Mt. Wellington (*A. M. Lea*) ; N. S. Wales : Mt. Victoria (*Lea*).

It may be considered that this species should have been treated as a variety of the preceding, but in addition to the differences in the antennæ, which alone would warrant its separation, the apex of the prosternum is very slightly but perceptibly bilobed, a feature which, if the artificial characters of *Loxoplcurus* were strictly adhered to, would even remove the two species from generic association.

Loxopleurus mitificus, n. sp.

♂. Head, prothorax, legs (the tarsi and apex of tibiæ infuscate) and five basal joints of antennæ pale reddish-testaceous; elsewhere black.

Head with small and not very dense punctures. Antennæ slightly shorter than body, second joint more than half the length of third, third slightly shorter than fourth and distinctly shorter than fifth. *Prothorax* very smooth; with small and sparse punctures except at sides; oblique impressions rather wide and deep; margins moderately wide. *Scutellum* triangular, base entire. *Elytra* oblong, subhumeral lobes small; densely and moderately coarsely punctate, punctures becoming smaller and seriate in arrangement posteriorly. Apex of *prosternum* widely subtriangular. Abdomen with third and fourth segments strongly incurved to and very narrow across middle.

Length 3 mm.

♀. Differs in having the femora stained with piceous, antennæ shorter and thinner; and punctures, especially on apical half of elytra, smaller and sparser. Fourth abdominal segment not traceable across middle; fovea large.

Length 3½ mm.

Hab. N. S. Wales: Newcastle (types in Macleay Museum), Gosford (*A. M. Lea*).

The female with very pale head and prothorax and smooth prothorax and elytra will distinguish this from the two preceding species and from *Lox. conjugatus*, Chp., and *piceitarsis*, Chp. In the only male I have seen the base of the head is somewhat infuscate and the punctures are considerably larger; it is, however, much smaller than the males of the above-mentioned species.

Loxopleurus dolens, n. sp.

♂. Black; lower half of face, corners of pronotum and apex and middle of prosternum flavous; legs blackish, in places obscure brown.

Head with sparse and moderately large punctures ; feebly strigose at base and sides of eyes. Antennæ somewhat shorter than body, second joint rather more than half the length of third, third and fifth subequal. *Prothorax* densely and coarsely punctate, punctures smaller and sparser on disc than elsewhere ; oblique impressions moderate ; margins very narrow. *Scutellum* triangular, base feebly notched. *Elytra* rather briefly oblong, subhumeral lobes not very small ; densely and coarsely punctate, punctures becoming subseriate in arrangement, with irregularly convex interstices posteriorly. *Pygidium* densely and rather coarsely punctate and with a fairly distinct median carina. Apex of *prosternum* widely subtriangular. Abdomen with the third and fourth segments strongly incurved to and just traceable across middle, fifth with a very distinct and fairly deep median impression.

Length 2¼ mm.

♀. Differs in having the legs, except the coxæ, entirely black and only the anterior angles of the pronotum flavous ; the antennæ are shorter and thinner and the punctures sparser and smaller. Abdomen with fourth segment not traceable across middle ; fovea large, slightly encroaching on third segment.

Length 2¾ mm.

Hab. W. Australia : Swan River (*A. M. Lea*).

From the sides the apical impression of the abdomen in the male appears to be margined by small tubercles, a character which alone should distinguish it from the allied species. In the only female I have seen the fourth segment appears to be very slightly sinuous, but this may be accidental.

The female (except that it is not entirely dark above) is not unlike a small specimen of *Lox. atramentarius*, Chp., but the scutellum is smaller and the punctures are different. The male of *Lox. obtusus*, Chp., has coarser punctures, longer scutellum and the body with a bluish gloss.

Loxopleurus microscopicus, n. sp.

(Plate XXIV, fig. 91.)

♂. Black ; sides of prothorax and of elytra, muzzle, middle and front of prosternum, intercoxal process and apex of abdomen flavous ; legs testaceous, tarsi infuscate ; four basal joints of antennæ testaceous, the rest infuscate.

Head with large but rather sparse punctures. Antennæ shorter than the body, second joint more than half the length of third, third

slightly shorter than fifth. *Prothorax* densely and coarsely punctate; oblique impressions rather feeble; margins narrow. *Scutellum* subtriangular, base entire. *Elytra* with small subhumeral lobes; densely and coarsely punctate, punctures somewhat smaller and sparser but with scarcely a trace of linear arrangement posteriorly. Apex of *prosternum* widely subtriangular. Third and fourth segments of abdomen strongly incurved to and narrow across middle, fifth flattened in middle.

Length 1½ mm.

♀. Differs in having less of the sides flavous, the antennæ shorter and punctures rather smaller. Abdominal fovea very large, strongly encroaching on fourth segment (which, however, is traceable across middle) and very slightly on third.

Length 2 mm.

Hab. W. Australia (types in Macleay Museum).

In the male the flavous portion of the upper-surface appears as a rather wide stripe extending from the front of the prothorax to the suture at apex of elytra; in the female this stripe is much narrower and darker, and on the elytra terminates just beyond the middle, although there is an obscure spot on each side of apex.

In appearance resembling the preceding species but considerably smaller, the pale lateral markings of much greater extent and with the abdomen different.

Loxopleurus marginipennis, n. sp.

(Plates XXIV, XXV, figs. 92, 133.)

♂. Black; lower half of head, sides of prothorax, subhumeral lobes, abdomen and legs reddish.

Head with rather large but not very dense punctures. Antennæ somewhat shorter than body, second joint more than half the length of third, third and fifth subequal. *Prothorax* more than twice as wide as long; with moderately dense, regular and fairly large (smaller on disc than elsewhere) punctures; oblique impressions rather wide and distinct; margins narrow. *Scutellum* triangular, base entire. *Elytra* with rather large subhumeral lobes, sides feebly but distinctly incurved to middle; densely and coarsely punctate, punctures somewhat smaller but not at all seriate in arrangement posteriorly. Apex of *prosternum* widely subtriangular. Fifth abdominal segment semicircularly excised in middle.

Length 2 mm.

♀. Differs in having the head and prothorax (except at the extreme

base of each), the sides of elytra to beyond the middle and the whole of the under-surface red.

Length 2¾ mm.

Hab. N. S. Wales: Mosman's Bay (*W. W. Froggatt*), Sydney (*A. M. Lea*).

A very distinct species not very close to any other known to me, and with the sexes differently coloured. The male in colour somewhat resembles some of the varieties of *lugubris*, n. sp., but is narrower in shape and with different sculpture. The dark elytra with pallid subhumeral lobes will distinguish the female from the females of other species having the prothorax red. In the male the red portion of the prothorax is about twice as wide at base as at apex. In both sexes the carina on the subhumeral lobes is paler than elsewhere and the antennæ are entirely black.

Loxopleurus castigatus, n. sp.

(Plate XXIV, figs. 93, 94.)

♂. Basal half of head, the antennæ and the scutellum black; elytra black with two flavous stripes, the outer one continued across apex almost to suture, the inner terminated at one-fourth from apex; prothorax (except at extreme base), under-surface (the metasternum infuscate or not) and legs (tarsi and apex of tibiæ black) red.

Head with moderately small and not very dense punctures. Antennæ shorter than body, second joint more than half the length of third, third and fifth subequal. *Prothorax* very densely and moderately coarsely punctate; transverse impressions distinct but scarcely perceptibly oblique; margins not very narrow. *Scutellum* transversely triangular, base entire. *Elytra* rather elongate-oblong, sides almost perfectly parallel, subhumeral lobes small; densely and moderately coarsely punctate, with traces of a linear arrangement almost to base but nowhere distinct; with traces of feeble longitudinal elevations. Apex of *prosternum* widely rounded. Fourth segment of abdomen just traceable across middle.

Length 2 (vix) mm.

♀. Differs in having the head red except at extreme base and a greater portion of the elytra flavous; the punctures smaller (especially on head) and antennæ just passing hind coxæ; fourth segment of abdomen appearing as an elongate wedge on each side, fovea comparatively small.

Length 2¾ mm.

Hab. N. S. Wales: Sydney (types in Macleay Museum).

A prettily-marked little species. The prothoracic margins and abdomen are paler than the disc of the prothorax, and are probably flavous in fresh specimens. In the female the elytra might be described as flavous with an oblong black patch, terminated (except for a narrow sutural extension) at apical fourth, the shoulders black, and a black elongate spot near apex, these evidently being relics of the black stripe separating the two flavous ones of the male.

Loxopleurus inconstans, n. sp.

(Plate XXIV, figs. 95, 96, 97.)

♀. Black; lower half of head, prothorax (a median stripe not continuous to base and the extreme base black), four (or two) elytral spots, base of femora (the front femora entirely) and of tibiæ red; margins of subhumeral lobes, intercoxal process, sides and apex of abdomen flavous.

Head with rather sparse and small punctures. Antennæ not much shorter than the body, second joint about half the length of third, third distinctly shorter than fifth. *Prothorax* with rather large, comparatively sparse and irregularly distributed punctures; oblique impressions rather deep and continuous across middle; margins narrow. *Scutellum* triangular, base entire. *Elytra* slightly dilated posteriorly; subhumeral lobes moderately large; base with moderately large and fairly dense punctures, apical two-thirds with small punctures in almost regular series. Apex of *prosternum* widely subtriangular. Fovea rather shallow, slightly encroaching on fourth segment and which is just traceable across middle.

Length 3½ mm.

Hab. S. Australia (Macleay Museum).

A somewhat variable species of which I only know the female. In one specimen there are two rather small red spots on each elytron, the first (on the third and fourth interstices) about one-third from base, the second (on second—fourth interstices) about one-third from apex; on the other specimen the basal spot is absent, and the apical one is very small and confined to the second interstice. The base of the tibiæ in both specimens is very obscure and the second—fourth joints of antennæ are very obscurely diluted with red.

There are two other females before me (from Tamworth and Hunter River in N. S. Wales) which with doubt I refer to this species; they differ in having the under-surface

and legs (except that the tarsi are infuscate) entirely pale, the pale elytral margin continuous almost to apex, and the discal spots appearing as interrupted longitudinal vittæ; in the Hunter River specimen the punctures are also larger although of the same kind.

Loxopleurus virgatus, n. sp.

(Plate XXIV, fig. 98.)

♀. Flavous, prothorax darker; basal half of head, extreme base of prothorax, scutellum, base suture and sides of elytra, metasternum and seven terminal joints of antennæ black; basal joint infuscate.

Head densely and rather coarsely punctate and feebly strigose. Antennæ thin, passing hind coxæ for a short distance, second joint rather more than half the length of third, third and fifth subequal. *Prothorax* about thrice as wide as long; densely and coarsely punctate, punctures smaller (but not sparser) on disc than elsewhere; oblique impressions fairly deep; margins narrow. *Scutellum* triangular, indistinctly notched. *Elytra* oblong, subhumeral lobes rather large; densely and coarsely punctate, punctures becoming subseriate in arrangement and somewhat smaller posteriorly, with traces of feeble longitudinal elevations. Apex of *prosternum* widely rounded. Fourth abdominal segment traceable across middle only from behind; fovea rather shallow.

Length $2\frac{1}{2}$ mm.

Hab. N. S. Wales: Rylestone (*W. W. Froggatt*), Forest Reefs (*A. M. Lea*).

The elytra might have been described as "black, with two rather wide and irregular flavous vittæ continuous to apex but not to base."

In appearance somewhat resembling the preceding species, but, apart from colour differences, with the head strigose and much more coarsely and densely punctate. It appears also to be close to *Lox. pectoralis*, Chp., but that species is described as having the prothorax fulvous in middle, elytra with the lateral vitta terminated before the apex and the interstices punctate.

Loxopleurus fuscitarsis, n. sp.

(Plates XXIV, XXVI, figs. 99, 200.)

♂. Black, lower half of head, prothorax (extreme base excepted), legs (tarsi and apex of tibiæ infuscate) and parts or the whole of

the four basal joints of antennæ red ; elytra (base, suture, and sides black) flavous.

Head densely but not coarsely punctate, base strigose. Antennæ thin, slightly longer than body, second joint more than half the length of third, third distinctly shorter than fourth and much shorter than fifth. *Prothorax* scarcely twice as wide as long ; moderately densely and rather coarsely punctate ; front gibbous ; oblique impressions fairly deep ; margins narrow. *Scutellum* triangular, base entire. *Elytra* briefly oblong, subhumeral lobes large ; densely but not very coarsely punctate, punctures almost regular in arrangement throughout but seriate only close to apex. Apex of *prosternum* widely rounded. Third and fourth segments of abdomen strongly incurved to and narrow across middle.

Length 3½ mm.

♀. Stouter, antennæ distinctly shorter than body and punctures rather smaller. Fovea moderately large, distinctly encroaching upon fourth segment, which is not traceable across exact middle.

Length 4⅓ mm.

Hab. W. Australia : (Macleay Museum) Swan River, Pinjarrah (*A. M. Lea*).

The dark sutural marking is dilated from about the middle to the apical fourth and then suddenly contracted. The colour (there are seven specimens before me), except for slight variation in the widths of the elytral markings, appears to be constant and is alike in both sexes.

In appearance somewhat resembling the preceding species but larger, the scutellum of different shape and the third and fifth joints of antennæ differently proportioned.

Loxopleurus contiguus, n. sp.

(Plate XXV, figs. 134, 135.)

♂. Black with a metallic-green gloss ; mandibles (tips excepted), sides of prothorax (at base the reddish portion advanced more than half-way to the middle), legs (tarsi infuscate) and apex of abdomen reddish ; elytra (except at base sides and suture which are black) almost flavous.

Head very densely punctate and strigose. Antennæ as long as body, second joint half the length of third, third distinctly shorter than fifth. *Prothorax* densely and coarsely punctate ; oblique impressions feeble ; margins rather narrow. *Scutellum* triangular, base distinctly notched. *Elytra* rather briefly oblong, subhumeral lobes small ; punctures as in the preceding species. Apex of *prosternum*

very wide and feebly triangularly produced in middle. Fourth segment of abdomen strongly incurved to and very narrow across middle.

Length 3 mm.

Hab. W. Australia: Swan River, Darling Ranges (*A. M. Lea*).

The sutural marking appears as an elongate triangle just touching the apex, the dark lateral markings do not extend quite so far. A second specimen differs in having the apical third of head, the apex base and sides of prothorax and the entire abdomen reddish; its elytral markings consist of a triangular patch (no longer than wide) about scutellum and the shoulders greenish-black, and an infuscate blotch on the sides about the middle.

In appearance resembling the preceding species to a certain extent but antennæ shorter, scutellum distinctly notched, prothorax partly dark and elytral markings of different shape. From *virgatus*, n. sp., to which it appears to be closer, it differs in its more distinctly notched scutellum, partly dark prothorax, rather denser punctures and smaller subhumeral lobes.

Loxopleurus absonus, n. sp.

(Plates XXIV, XXVI, figs. 100, 101, 201.)

♂. Suboblong, subopaque. Chocolate-brown, pygidium, apex of abdomen, base of antennæ and legs (tarsi excepted or not) paler.

Head with small but moderately dense punctures. Antennæ thin, the length of body, second joint almost as long as third, third and fourth subequal and distinctly shorter than fifth. *Prothorax* not twice as wide as long; with dense and clearly cut but small punctures; regularly and rather strongly convex; oblique impressions absent; margins narrow. *Scutellum* fully twice as long as wide, base entire and not much wider than apex. *Elytra* briefly oblong, subhumeral lobes small; densely and rather finely punctate, punctures becoming smaller and seriate in arrangement posteriorly. Apex of *prosternum* widely rounded. Abdomen with the second segment very narrow and the third and fourth just traceable across middle.

Length 2½ mm.

♀. Differs in being entirely of a dingy flavous or testaceous—except at the junction of the prothorax with the elytra and scutellum, the metasternum, a subapical elytral fascia and the outer half of

antennæ. It is stouter, antennæ shorter than body and punctures (except on elytra where they are larger) smaller. Abdominal segments with straighter sutures, the fourth feebly encroached upon by fovea, the latter shallower than usual.

Length 3 mm.

Hab. N. S. Wales: Kiama, Manly, Sydney (Macleay Museum), Galston (*A. M. Lea*).

A very distinct species from many points of view. The narrow scutellum is suggestive of *Diandichus*, but the shape of the body is different and the abdominal fovea is under instead of above the usual size.

In three males before me the elytra are immaculate, but in two others there is a small pallid spot on each close to the suture about the middle, and in one of these the outer portions of the subhumeral lobes are pallid; this specimen also has the base and sides of the prothorax paler than the disc and its head is pallid. On the type female the elytral fascia is very distinct and is of a bright chocolate-brown colour, with a vague stain extending towards the apex; in two other females the fascia is traceable with difficulty. In addition to the punctures described the whole of the upper surface is very densely and minutely punctate, in consequence of which it becomes subopaque; but on the elytra of the female these punctures are usually very indistinct.

Loxopleurus immaturus, n. sp.

♀. Subopaque. Flavous; head, antennæ (basal joint diluted with red), junction of prothorax and elytra, scutellum and metasternum black; shoulders and suture of elytra, base of first abdominal segment and the tarsi infuscate.

Head densely and finely and very densely and extremely minutely punctate; without traces of a median impression. Antennæ just passing hind coxæ, second joint more than half the length of third, third shorter than fifth. *Prothorax* densely but not very coarsely punctate; oblique impressions indistinct, margins narrow. *Scutellum* subtriangular, base entire. *Elytra* slightly dilated posteriorly, subhumeral lobes small; densely but not coarsely punctate, with traces of feeble longitudinal elevations, which posteriorly cause the punctures to appear in feeble series. Apex of *prosternum* not very widely triangular. Fovea decidedly encroaching upon fourth segment (which except from behind is not traceable across middle) and slightly on third.

Length 3 mm.

Hab. W. Australia: Swan River, Pinjarrah (*A. M. Lea*).

A pallid subopaque species not very close to any other known to me. The tarsi are sometimes almost black, the basal joints, however, are usually not so dark as the apical. In one specimen the hind femora are infuscate. The elytra, abdomen, pygidium and sides of prothorax are usually paler than elsewhere.

Loxopleurus disconiger, n. sp.

(Plates XXIV, XXV, figs. 102, 152, 174.)

♂. Short, moderately shining. Black; sides and base of prothorax widely reddish; legs black or piceous, the coxæ paler.

Head densely and finely and very densely and extremely minutely punctate. Antennæ slightly shorter than body, second joint distinctly more than half the length of third, third very little longer than fourth and distinctly shorter than fifth. *Prothorax* densely and moderately coarsely punctate; disc rather strongly gibbous; oblique impressions very short; margins narrow. *Scutellum* elongate-triangular, base notched. *Elytra* almost quadrate, subhumeral lobes moderately large; densely and moderately coarsely punctate throughout, but punctures posteriorly becoming somewhat smaller and subseriate in arrangement with irregularly elevated interstices. Apex of *prosternum* very wide, triangularly prolonged in middle. Third and fourth abdominal segments strongly incurved to with the fourth just traceable across middle.

Length 2 mm.

♀. Differs in having a wide pallid fascia just before the middle of the elytra and interrupted at suture, and a large apical spot on each quite close to the suture. Antennæ shorter and thinner and punctures smaller. Fovea large, decidedly encroaching upon fourth segment and which, as in the male, is just traceable across the middle.

Length 2½ mm.

Hab. N. S. Wales: Sydney (*H. J. Carter* and *A. M. Lea*); S. Australia (Macleay Museum).

A small widely distributed and very aberrant species with the sexes greatly differing in size and markings, and the markings of both sexes variable to a certain extent. The dark part of the prothorax appears sometimes almost as a semicircle (the convex side hindward), sometimes as transversely suboblong; in both sexes it extends to the extreme apex and is connected with the

base by an infuscate streak (sometimes very dark, at others just perceptible). The median elytral fascia in some specimens is scarcely interrupted at the suture and its shape and size are slightly variable, the subapical spots are also variable in size. In the female the dark portions instead of being deep black are occasionally dark chocolate-brown.

A male from W. Australia (in the Macleay Museum) has elytral markings much as in the female, except that the median fascia is more obscure and the apical spots considerably larger, its legs (tarsi excepted) and the apical half of abdomen are also obscure testaceous.

Brachycaulus posticalis, n. sp.

♂. Oblong, tuberculate, pubescent, opaque. Testaceous (the appendages slightly paler than the body); the tips of mandibles and of claws and the junction of prothorax with scutellum and elytra darker. Rather densely clothed with short golden pubescence, somewhat sparser on elytra and abdomen than elsewhere.

Upper-surface densely and finely punctate, the punctures on elytra larger than elsewhere. *Head* with a feeble median impressed line. Antennæ slightly longer than the body, the third joint but slightly longer than second. *Prothorax* fully twice as wide as long, disc gibbous and with two obtuse protuberances, sides serrated, base and apex obtusely produced in middle. *Scutellum* subtriangular, base notched, apex truncate; elevated and subcarinate along middle. *Elytra* suboblong, the interstices alternately irregularly subtuberculate, the third with a rather large tubercle at summit of posterior declivity. *Claw joint* long and free.

Length $2\frac{3}{4}$ mm.

♀. Differs in being larger, with antennæ (the joints of which are shorter in proportion) shorter than the body. The apical fovea is large and without lateral connections.

Length $3\frac{3}{4}$ mm.

Hab. N. S. Wales: Glen Innes, Gosford (*A. M. Lea*).

The elytra are very irregularly elevated in places, but there is always a large tubercle on each at the summit of the posterior declivity; in the males the hollows (on the elytra) are sometimes supplied with dark velvety spots. In one male the sternal regions are almost black.

From *Klugii*, Saund., and all the varieties of *ferrugineus*, Fairm., it differs in its much smaller size and very different antennæ, claws, tubercles and clothing; it is of almost the

same comparative width as *Klugii*. In some respects it approaches the description of *Cadmus lacertinus*, Chp. (which is probably a *Brachycaulus*), but Chapuis describes the head of that species as flavo-pilose and makes no mention of clothing elsewhere, he also says, "*Capite medio foveolato. Pronoto tuberculis inæqualibus nitidisasperato.*"

Brachycaulus mamillatus, n. sp.

♀. Oblong, opaque, glabrous. Of a rather dark sanguineous red, elytra abdomen and legs somewhat paler, antennæ and tarsi still paler; margins of prothorax, scutellum (base and apex narrowly black) and base of elytra flavous.

Body and legs densely, rather coarsely and regularly punctate throughout. *Antennæ* short, just passing scutellum, seventh—tenth joints transverse. *Prothorax* about twice as wide as long, sides and base finely serrate; disc with two large, obtuse, rounded, granulate tubercles. *Scutellum* slightly longer than the width at base, base scarcely visibly notched, sides incurved, apex truncate and about half the width of base. *Elytra* with feebly elevated alternate interstices, and each with a large transverse granulate tubercle at summit of posterior declivity. *Apical fovea* large, encroaching on the fourth segment, and with shallow lateral extensions. *Claw joint* wide and deeply buried, the claws almost resting on the third joint.

Length 5 mm.

Hab. Queensland: Tambourine (type in *R. Illidge's* collection).

A beautiful species very distinct from any previously described. The colour of the prothorax and sterna is somewhat like dried blood; the flavous marking at base of elytra shows a tendency to extend itself along the interstices, there is also a feeble flavous line connecting the apical tubercles. The punctures are not of the ordinary round clearly-cut type, but each appears as if margined by minute granules, they are just as dense at the apex as at the base of the elytra, and are nowhere seriate in arrangement.

Brachycaulus aterrimus, n. sp.

(Plate XXV, figs. 175, 177, 179.)

♀. Suboblong, roughly sculptured, subopaque, glabrous. Entirely deep-black.

Head flattened; with dense, large, round, shallow punctures, on the middle of the vertex sparser, and (although not larger) more distinct. Antennæ very short, scarcely longer than the width of the head. *Prothorax* much less than twice as wide as long, disc strongly gibbous and with a rather narrow ridge on each side of the middle, at the sides of these a feeble ridge, between these and sides a small obtuse tubercle; sides serrate; irregularly punctate but with large and almost regular punctures margining the base apex and sides; base strongly produced backwards; anterior angles strongly rounded and much below the level of base. *Scutellum* strongly transverse, flat, level with suture, apex much wider than base, sides incurved to base. *Elytra* suboblong, strongly convex, shoulders strongly produced, subhumeral lobes deep, suture finely serrate; disc very irregularly elevated and with large foveate punctures much interrupted by the elevations. *Pygidium* with large punctures irregularly distributed and with a continuous distinct, narrow median carina. *Under-surface* and *legs* with punctures much as on head. Intercoxal process of prosternum funnel-shaped, the top of the funnel acting as a chin-piece; process of mesosternum deeply notched in front. Abdomen large, the first segment large at sides small in middle, second, third and fourth narrow and semicircular, fifth large, with a wide and rather shallow fovea having wide lateral extensions. Tarsi very short and wide, the claws almost resting on the third joint.

Length 4 mm.

Hab. QUEENSLAND: Cleveland Bay (type in Macleay Museum).

The elytra are very roughly sculptured, seen from above the sides appear to be incurved, there is a large granulate tubercle on each in the middle of the base, each also has a narrow very irregular strongly elevated ridge (with numerous offshoots) running obliquely from the shoulder to beyond the middle, whence it curves outwards. Owing to its extensions the apical fovea at first glance appears as if widely transverse. In the type only one antenna is perfect and at present is resting in a prosternal groove (much as in many *Elateridæ*), and as the specimen is not my own I have not cared to risk breaking it to examine and figure the joints. The prothorax produced at the middle of the base with the strongly elevated disc are reminiscent of certain plant bugs of the family *Membracidæ*. The shape of the scutellum and many other unusual features combine to render this the most distinct Australian

species of the subfamily; and I have no doubt but that in the hands of some others it would have been considered as the type of a new genus.

Cadmus T-niger, n. sp.

♀. Elongate-oblong, moderately shining. Reddish-testaceous, basal half of head and two oblique lines in front, extreme base of prothorax, scutellum (except in middle), base and suture of elytra, pygidium, greater portion of under-surface and femora (except at base and apex), black—with or without a greenish gloss; tarsi, apex of tibiæ and antennæ (except the second—fifth joints) more or less infuscate, margins of prothorax pallid. Pygidium and under-surface with silvery pubescence.

Head densely and coarsely punctate, punctures frequently longitudinally confluent. Antennæ long, thin, and passing apex of body, second joint less than one-third the length of third, third distinctly longer than fifth, sixth—tenth gradually decreasing in length. *Prothorax* not twice as wide as long; coarsely punctate, the punctures rougher at sides than on disc; margins rather wide, incurved at middle, oblique impressions fairly deep but indistinct. *Scutellum* subtriangular, apex truncate, base rather deeply notched; impunctate. *Elytra* oblong, narrowest near base, shoulders thickened and smooth, subhumeral lobes rather small; densely and coarsely punctate, punctures seriate in arrangement, with convex interstices posteriorly; basal half transversely rugose. *Pygidium* densely and rather finely punctate. *Under-surface* rather densely transversely strigose. Prosternum obtusely rounded at hind apex, and feebly ridged along middle. Fourth segment of abdomen continuous but encroached upon by fovea, this large deep and rather more densely clothed than usual, and with scarcely traceable lateral extensions.

Length 7½–9 mm.

Hab. N. S. Wales: Mt. Kosciusko (*W. E. Raymond* and *R. Helms*).

The dark part of the elytra resembles the letter T, from the base the dark marking is continued on to the humeral callosities, in one specimen stopping there, in a second continued (except for a break in its middle) to beyond the middle (but not touching the sides).

A rather small female specimen, which I can only regard as a variety, differs in having the punctures much coarser, with the antennæ stouter and shorter than the body. Its head (except for an obscure space behind each eye), the sides and apex of prothorax, the scutellum, the outer

margins of elytra to beyond the middle, and the under-surface are black; whilst the legs (except for the two terminal joints which are almost black) are entirely reddish; the five basal joints of the antennæ are also pale.

Cadmus calomeloides, n. sp.

♂. Oblong, moderately shining. Of a rather dingy (but the under-surface clear) flavous; extreme base of prothorax, elytra and scutellum reddish-brown, punctures more or less stained with brown.

Head densely and rather coarsely punctate, vertex feebly impressed. Antennæ passing apex of body, second joint less than half the length of third. *Prothorax* not twice as wide as long; rather densely and coarsely punctate; sides almost regularly decreasing in width from base to apex; margins rather narrow and entire; oblique impressions feeble. *Scutellum* feebly transverse, apex truncate, sides incurved, base deeply notched; impunctate. *Elytra* with feeble subhumeral lobes; densely and coarsely punctate, punctures subseriate in arrangement posteriorly. *Pygidium* distinctly carinate; densely and moderately coarsely punctate. *Prosternum* flattened along middle, feebly emarginate, hinder apex obtusely rounded. Fifth segment of abdomen large, apex bilobed.

Length 4 mm.

♀. Differs in being larger, with antennæ at most just passing apex of body, the punctures smaller, not so deeply stained, and on the elytra decidedly geminate in arrangement. Fourth segment of abdomen just traceable across middle, apical fovea large, with distinct lateral extensions.

Length 6 mm.

Hab. Victoria (National Museum); S. Australia; N. S. Wales: Gunning (Macleay Museum).

In general appearance much resembling the genus *Calomela*. The stains in the ♀ do not extend beyond the punctures, but in the ♂ they frequently do so, especially on the elytra.

This species agrees to a certain extent with the description of *Rhombosternus cicatricosus*, Chp.; but Chapuis says of that species, "*Elytris foveolatis . . . inæqualibus, rotundatis vel subquadratis;*" whilst in this species the punctures, though coarse, are by no means of unusual size, and are in many places geminate in arrangement.

Cadmus quadrifasciatus, n. sp.

(Plates XXIV, XXV, figs. 103, 104, 153.)

♂. Elongate-oblong, subopaque. Black; apex and sides of prothorax (except the extreme margins), four incomplete elytral fasciæ, front sides of prosternum, apex and intercoxal process of abdomen, and basal half of tibiæ flavous; second—fifth joints of antennæ reddish.

Upper-surface (including scutellum) densely and coarsely punctate, the punctures more or less angular. *Head* feebly longitudinally impressed; eyes larger and closer together than usual. Antennæ considerably longer than the body, second joint less than one-third the length of third, fifth distinctly longer than sixth. *Prothorax* about once and one-half as wide as long; oblique impressions feeble; margins rather narrow and crenulate. *Scutellum* suboblong, base indistinctly notched, apex truncate, ridged along middle. *Elytra* oblong, subhumeral lobes small, interstices acutely elevated, the alternate ones irregular across middle. Intercoxal process of *prosternum* wide, front thin and entire, hind apex very obtusely rounded.

Length 4¾ mm.

Hab. N. S. Wales: Jenolan (*J. C. Wilburd*).

The elytral fasciæ should perhaps be regarded as transverse spots, they are almost equidistant from each other, the three first distant about two interstices from the suture, the fourth on the apex itself and just perceptibly interrupted at suture and terminated almost on the margin; the second extends over the greatest, whilst the first extends over the shortest space; the outlines of all are very irregular although sharply defined.

In appearance somewhat resembling *Cadmus luctuosus*, Chp., but (apart from colour markings) of smaller size, elytra much more acutely costate, the prothoracic punctures rougher and the abdominal segments much less curved. It is also evidently allied to *Paracadmus maculatus*, Blackb., but besides the numerous differences in colour, some of the elytral carinæ are distinct from base to apex, whilst in *maculatus* the elytra are described as "*postice subcostatis.*"

There are two female specimens before me (both from Victoria) which with some doubt I refer to this species; they differ in having the prothorax pallid except for a wide transverse marking (much as in many of the varieties of *crucicollis*), the elytral fasciæ wider and larger, with the

two basal ones conjoined, and (in one of the specimens) appearing as an irregular figure *2* on each elytron, that on the left being reversed. The fourth abdominal segment is emarginate in middle and the apical fovea large, without lateral extensions.

Cadmus fasciaticollis, n. sp.

(Plate XXV, figs. 154, 155.)

♀. Oblong-obovate, moderately shining. Reddish-testaceous; base of head, a narrow transverse fascia on prothorax (angularly dilated both ways in middle), extreme base of prothorax and elytra, the suture very narrowly, scutellum and under-surface (except prosternum—there is, however, a small black spot on each side in front and an obscure dark space between the base of the front coxæ, and apex of abdomen), black with a greenish gloss; sides of prothorax paler than elsewhere.

Head densely and coarsely punctate; with a moderately deep median impression. Antennæ just passing hind coxæ, second joint about half the length of third. *Prothorax* fully twice as wide as long; densely and rather coarsely punctate, oblique impressions rather feeble; margins entire and moderately wide. *Scutellum* subquadrate, base distinctly notched; with a few small punctures. *Elytra* with small subhumeral lobes; densely and rather coarsely punctate, punctures becoming smaller and seriate in arrangement with convex interstices posteriorly; base transversely rugulose. Apex of *prosternum* very obtusely produced in middle. Fourth segment of abdomen just traceable (not at all from above) across middle; apical fovea without lateral extensions.

Length 6½ mm.

Hab. Tasmania: Summit of Mt. Wellington (*A. M. Lea*).

A very distinct species. The prothoracic fascia is like that of some of the varieties of *crucicollis,* but the two species have little else in common.

A second female (from Waratah in Mr. Aug. Simson's collection) differs in having the fascia much larger, with the hind projection from its middle touching the base; the elytra with a greater portion of the base dark, the dark part advanced along the suture and near (but not on) the sides to about the middle, but, especially posteriorly, somewhat of the nature of a stain, the metasternum is also black. In this specimen also the scutellum is impunctate.

Cadmus apicirufus, n. sp.

(Plate XXIV, fig. 105.)

♂. Oblong, shining. Head (base blackish), prothorax (the sides paler), an inner spot at the apex of each elytron and the coxæ reddish ; middle of pro- and meso- and flanks of metasternum, abdomen (the second—fifth segments infuscate in middle), pygidium (a small infuscate spot on each side) and subhumeral lobes pale flavous ; elsewhere black or blackish.

Head densely and coarsely punctate. Antennæ rather stout, not extending to apex, second joint slightly shorter than third or fourth, sixth distinctly longer than first, seventh—tenth gradually decreasing in length. *Prothorax* about once and one-half as wide as long ; disc gibbous ; margins entire and rather narrow ; densely punctate, the punctures rather coarse at sides ; oblique impressions feeble. *Scutellum* subquadrate, base indistinctly notched and feebly punctate. *Elytra* suboblong, widest across shoulders (which are thickened and impunctate), subhumeral lobes large ; densely and coarsely punctate, the punctures almost as dense and large at apex as at base. *Pygidium* densely and rather coarsely punctate. *Under-surface* irregularly punctate, the punctures larger and sparser on metasternum and intercoxal process of prosternum than elsewhere, the latter in front produced backwards like a lip, the hind apex very obtusely rounded. Apex of abdominal segments (except the first) semicircular, the fifth encroached upon by the pygidium.

Length $3\frac{3}{4}$ mm.

♀. Differs in being larger, with shorter antennæ, and of which the first joint is distinctly the longest ; eyes smaller and more distant, its head (except for the antennæ, which are deep black in both sexes) is entirely red, the scutellum is red, the abdomen with more of the middle infuscate and the two small spots on the pygidium scarcely traceable. Fourth segment of abdomen just traceable across middle, apical fovea with feeble lateral extensions.

Length 4 mm.

Hab. S. Australia (types in Macleay Museum).

A remarkably distinct species apart from its peculiar coloration. There is a striking departure in the shape of the intercoxal process of the prosternum in that the front portion is strongly raised and projects backwards so as to overhang like a lip; a character that by some entomologists would probably be regarded as of generic importance.

Cadmus perlatus, n. sp.

♀. Short, subelliptic, rough, feebly shining. Obscure testaceous or testaceous-brown; middle of sterna and of basal segment of abdomen blackish.

Upper-surface (including scutellum), densely and moderately coarsely punctate, punctures coarser on prothorax and smaller at apex of elytra than elsewhere. *Head* feebly longitudinally impressed. Antennæ extending to second abdominal segment, second joint more than half the length of third, fourth scarcely if at all shorter than fifth. *Prothorax* about thrice as wide as long, surface uneven; margins narrow and entire; oblique impressions very indistinct. *Scutellum* transverse, apex less than half the width of base, obtusely ridged along middle. *Elytra* short, subhumeral lobes feeble, sides rounded and regularly diminishing from base to apex, surface uneven and with traces of feeble longitudinal elevations. *Pygidium* almost or quite covered by elytra. Apex of *prosternum* obtusely rounded. Fourth segment of abdomen semicircularly emarginate and not traceable across middle; apical fovea unusually large, without lateral extensions.

Length 4 mm.

Hab. N. S. Wales: Sydney (*H. J. Carter* and Macleay Museum).

An unusually wide species with the outline more rounded than usual; the upper-surface has a mottled appearance, principally owing to the punctures being darker than the general surface.

A larger specimen (5¼ mm. and also from Sydney) has the upper-surface not at all mottled, but the under-surface more irregularly stained with brown and the femora also stained. At a glance it appears to be distinct, but I can find no structural characters warranting its separation.

Cadmus nothus, n. sp.

♂. Oblong-elliptic, subopaque. Testaceous-red, a narrow streak on face terminated between front of eyes, a longitudinal curved spot towards each side of prothorax and nearer base than apex and extreme base of prothorax, elytra and scutellum black, terminal joint of antennæ and portion of flanks of metasternum infuscate; elytra (but the punctures the colour of prothorax), sides of prothorax, pygidium, abdomen and portions of sterna flavous.

Head, prothorax and scutellum rather coarsely and very densely punctate, the elytra with larger punctures, but round and clearly

defined, and with irregular traces (even towards the base) of a linear arrangement. *Head* with a feeble median impression. Antennæ passing apex of body, moderately stout, second joint about one-third the length of third. *Prothorax* about twice as wide as long, oblique impressions very feeble, margins rather wide and feebly crenulated. *Scutellum* ridged along middle, apex truncate and not much narrower than base, sides incurved. *Elytra* narrowest just beyond shoulders, subhumeral lobes feeble. Intercoxal process of *prosternum* bilobed, both in front and behind. Three basal segments of abdomen straight at apex, fifth feebly depressed in middle.

Length 5½ mm.

♀. Differs in being larger, the eyes smaller and more widely separated; the antennæ thinner and shorter than the body and the elytra with smaller punctures, having even less traces of a linear arrangement. The antennæ are of uniform colour and no parts (except the junction of the prothorax with the scutellum and the elytra) are black. Fourth segment of abdomen distinct across middle and very feebly encroached upon by the fovea, the latter with feeble lateral extensions.

Length 7½ mm.

Hab. W. Australia: Karridale (*A. M. Lea*).

The elytra have a mottled appearance owing to the punctures being darker than the general surface, the darker portions also appear to be in feeble lines. Although the hind apex of the prosternum is bilobed I have referred this species to *Cadmus*, as it is evidently closely allied to *Cadmus scutatus*, Chp. (in which the apex is rounded). At first sight indeed it appears to belong to *scutatus*, but the two species are readily distinguished by the shape and punctures of the scutellum.

Above are described seven species of *Cadmus*, and it will be noticed that the prosternum is not exactly the same in any two of them, although in all (except the last) it is more or less rounded at the hind apex. In fact *apicirufus* and *perlatus* are about as dissimilar species as almost any other two (leaving out the tuberculate species) in the subfamily. To found genera principally on variations of the prosternum (as done by Suffrian and Chapuis), or of the antennæ (as by Saunders and Baly), or whether the prothorax has entire or crenulated margins, would necessitate almost as many genera as there are species; at least so far as the Australian species are concerned.

Explanation of Plates.

Plate XXII.

Elytron of—

FIG.

1. 2. *Cadmus litigiosus*, Boh.
3. „ *excrementarius*, Suffr.
4. „ *histrionicus*, Chp.
5. 6. 7. „ *luctuosus*, Chp.
8. „ *ornatus*, Chp.
9. „ „ „ var.
10. „ *quadrivittatus*, Chp.
11. „ *trispilus*, Chp.
12. 13. 14. „ *pauperculus*, Chp.
15. 16. 17. 18. 19. 20. *Cryptocephalus crucicollis*, Boi.
21. „ *speciosus*, Boi.
22. 23. „ *castus*, Suffr.
24. 25. 26. 27. „ *parentheticus*, Suffr.
28. „ *eumolpus*, Chp.
29. „ „ „ var.
30. „ *bihamatus*, Chp.
31. „ *terminalis*, Chp.
32. „ *gracilior*, Chp.
33. „ *chrysomelinus*, Chp., var.
34. 35. „ *jocosus*, Chp.

36.
37. *Cryptocephalus iridipennis*, Chp., var.
38. „ *aciculatus*, Chp.
39. „ „ „ var.
40. „ *filum*, Chp.
41.
42. „ *argentatus*, Chp.

Plate XXIII.

Elytron of—

FIG.

43.
44.
45.
46.
47. *Cryptocephalus dichrous*, Chp.
48. *Idiocephala catoxantha*, Saund.
49.
50.
51.
52. „ *bynoei*, Saund.
53. „ *albilinea*, Saund.
54.
55. „ *flaviventris*, Saund.
56. *Ochrosopsis eruditus*, Baly.
57. *Rhombosternus sulphuripennis*, Baly.
58. *Prionopleura erudita*, Blackb.
59. *Chariderma pulchella*, Baly, var.
60.
61. *Schizosternus coccineus*, Chp.
62.
63. „ *albogularis*, Chp.
64.
65. *Mitocera viridipennis*, Saund.
66. *Loxopleurus gravatus*, Chp., var.
67. „ *erythrotis*, Chp.
68. *Cryptocephalus clarus*, n. sp.
69. „ *lilliputanus*, n. sp.
70. „ *rufoterminalis*, n. sp.

71.
72. *Cryptocephalus conspiciendus*, n. sp
73. „ *basizonis*, n. sp.
74.
75. „ *comptus*, n. sp.
76.
77.
78. „ *minusculus*, n. sp.
79.
80.
81. „ *T-viridis*, n. sp.
82. „ *scabiosus*, n. sp.
83.
84. „ *ornatipennis*, n. sp.

Plate XXIV.

Elytron of—

FIG.

85. *Schizosternus trilineatus*, n. sp.
86. „ *marmoratus*, n. sp.
87.
88. „ *crassicornis*, Chp.
89. *Loxopleurus lateriflavus*, n. sp.
90. „ *mixtus*, n. sp.
91. „ *microscopicus*, n. sp.
92. „ *marginipennis*, n. sp.
93.
94. „ *castigatus*, n. sp.
95.
96. „ *inconstans*, n. sp.
97.
98. „ *virgatus*, n. sp.
99. „ *fuscitarsis*, n. sp.
100. „ *absonus*, n. sp.
101. „ „ „ var.
102. „ *disconiger*, n. sp.
103.
104. *Cadmus quadrifasciatus*, n. sp.
105. „ *apicirufus*, n. sp.

Prothorax of—

106. *Prasonotus submetallicus*, Suffr., var.
107. *Cadmus scutatus*, Chp.
108–110. „ *luctuosus*, Chp.
111. „ *quadrivittatus*, Chp.
112–115. „ *aurantiacus*, Chp.
116–119. *Cryptocephalus crucicollis*, Boi.
120, 121. „ *parentheticus*, Suffr.
122, 123. *Prionopleura erudita*, Blackb.
124. *Chariderma pulchella*, Baly, var.
125. *Cryptocephalus melanopus*, n. sp.
126, 127. „ *lilliputanus*, n. sp.
128. *Schizosternus marmoratus*, n. sp.
129, 130. „ *crassicornis*, Chp.

Plate XXV.

Prothorax of—

FIG.
131. *Schizosternus crassicornis*, Chp.
132. *Loxopleurus lugubris*, n. sp.
133. „ *marginipennis*, n. sp.
134, 135. „ *contiguus*, n. sp.

Prothoracic markings of—

136, 137. *Cryptocephalus consors*, Boi.
138. „ *speciosus*, Boi.

139.–142. *Cryptocephalus bihamatus*, Chp.
143.–144. „ *aciculatus*, Chp.
145. „ *eumolpus*, Chp.
146. „ *variipennis*, n. sp.
147. „ *clypealis*, n. sp.
148. „ *distortus*, n. sp.
149. „ *comptus*, n. sp.
150.–151. „ T-*viridis*, n. sp.
152. *Loxopleurus disconiger*, n. sp,
153. *Cadmus quadrifasciatus*, n. sp.
154.–155. „ *fasciaticollis*, n. sp.

Scutellum of—

156. *Cryptocephalus tricolor*, Fab.
157. „ *consors*, Boi.
158. „ *bihamatus*, Chp.
159. „ *chrysomelinus*, Chp.
160. *Idiocephala bynoei*, Saund.
161. „ *cyanipennis*, Saund.
162. „ *pulchella*, Saund.
163. *Ochrosopsis subfasciatus*, Saund.
164. „ *eruditus*, Baly.
165. *Diandichus analis*, Chp.
166. *Mitocera viridipennis*, Saund.
167. *Cryptocephalus mediocris*, n. sp.
168. „ *rubicundus*, n. sp.
169. „ *pallens*, n. sp.
170. „ *basizonis*, n. sp.
171. „ *costipennis*, n. sp.
172. *Schizosternus marmoratus*, n. sp.
173. „ *crassicornis*, Chp.
174. *Loxopleurus disconiger*, n. sp.
175. *Brachycaulus aterrimus*, n. sp.

Intercoxal process of—

176. *Schizosternus delicatulus*, n. sp.
177. *Brachycaulus aterrimus*, n. sp.

Tarsus of—

178. *Lachnabothra saundersi*, Baly.
179. *Brachycaulus aterrimus*, n. sp.

Plate XXVI.

Antenna of—

FIG.

180. } *Lachnabothra saundersi*, Baly.
181. }
182. *Cadmus histrionicus*, Chp.
183. } *Cryptocephalus clavicornis*, Chp.
184. }
185. } „ *bihamatus*, Chp.
186. }
187. *Idiocephala bynoei*, Saund.
188. „ *cyanipennis*, Saund.
189. „ *pulchella*, Saund.
190. *Ochrosopsis subfasciatus*, Saund.
191. *Chariderma pulchella*, Baly.
192. *Cryptocephalus distortus*, n. sp.
193. „ *rufoterminalis*, n. sp.
194. „ *T-viridis*, n. sp.
195. „ *convexicollis*, n. sp.
196. „ *cœlestis*, n. sp.
197. „ *costipennis*, n. sp.
198. *Loxopleurus castor*, n. sp.
199. „ *pollux*, n. sp.
200. „ *fuscitarsis*, n. sp.
201. „ *absonus*, n. sp.

XVI. *New Species of South American* Erycinidæ. By Percy I. Lathy, F.Z.S., F.E.S.

[Read April 20th, 1904.]

Plate XXVII.

On the appearance of Mr. Godman's paper on *Erycinidæ*, Trans. Ent. Soc. Lond. 1903, Part IV, I decided to work out the hitherto unnamed species in Mr. Herbert J. Adams' collection, the result being the discovery of the ten new species here described and figured. The Peruvian species were all taken by Messrs. Watkins and Tomlinson.

Eurygona subargentea, sp. nov. (Plate XXVII, fig. 1.)

♂. Upper-side.—Fore-wing blackish-brown, paler at apex; hind-wing blackish-brown, paler along costa.

Under-side.—Fore-wing silvery white crossed by two brown lines, one beyond cell, the other near outer margin; the ground colour beyond the inner line darker than basal half, the outer line inwardly edged with a row of silvery white spots; hind-wing silvery white crossed by a brown line beyond cell, this line acutely angled below lower median nervule, two waved submarginal brown lines, outer margin darker as in fore-wing.

Expanse 46 mm.

Hab. Bogota, Columbia, 1 ♂.

This fine species appears to have no near ally in its genus.

Mesosemia elegans, sp. nov. (Plate XXVII, fig. 2.)

♂. Upper-side.—Fore-wing black crossed by a curved white band beyond cell, this band widely edged inwardly with pale blue, which colour extends into cell encircling a black spot, this spot contains three white points one in centre and two beyond, the outer edge of white band narrowly pale blue; hind-wing black crossed by a similar band to fore-wing but the blue area much more restricted, and three black lines, broken in middle, traversing inner blue area.

Under-side.—Fore-wing with basal half brown, a yellowish ringed black spot containing white points as above at end of cell, and a dark patch below it, three dark lines before spot and three beyond, white band and outer margin as above but without blue; hind-wing with basal half brown crossed by nine dark lines, the centre one being broken into spots, white band and outer margin as above but without blues.

Expanse 40 mm.

Hab. La Merced, Peru, 2500 ft., 1 ♂.

This species has as its nearest ally *M. jcziela*, Butl., but it may be easily distinguished by the absence of white on the outer margin of the hind-wing above. In Mr. Grose-Smith's collection is a specimen from Ecuador which probably belongs to the species here described, it differs in the reduction of the blue and white bands. I think, however, that there is no doubt that specimens will eventually be procured that will connect the two forms.

Erycina latifaseiata, sp. nov. (Plate XXVII, fig. 3.)

♂. Upper-side.—Fore-wing black crossed at centre by a wide slightly-curved scarlet band; hind-wing black, a narrow scarlet band beyond centre extending from costa two-thirds of distance across wing, a few blue scales at end of this band, a faint red spot on inner margin, three pale centred metallic blue spots at base of tail, a dark blue streak in tail; cilia white in interspaces particularly at anal angle.

Under-side.—Fore-wing metallic blue changing to green in certain lights; base, costa, apex, nervules and an oblique band from costa to anal angle black, inner margin blackish-brown with a scarlet patch just before anal angle; hind-wing shining blue changing to green in certain lights; base, nervules, outer margin and a band just beyond centre black, a scarlet spot at anal angle and a white spot below it.

Expanse 54 mm.

Hab. San Remon, Peru, 3000 ft., 2 ♂ ♂ (type); La Merced, Peru, 4 ♂ ♂.

Closely allied to *E. huascar*, Saund., from which it may be distinguished by the much wider and more curved scarlet band of the fore-wing above, and the shorter scarlet band of the hind-wing.

Ithomiola rubrolincata, sp. nov.

Ithomiola celtilla, var., Hew., Ex. Butt. v. *Erycinidæ*, f. 3, 1876.

This species may easily be separated from typical *celtilla*, Hew., by the submarginal reddish lines above, and by the subapical white band of fore-wing, neither being hyaline nor broken by black nervules. Mr. Adams has a female from Rio Colorado, Peru, 2500 ft.

Themone trivittata, sp. nov. (Plate XXVII, fig. 4.)

♂. Upper-side.—Fore-wing yellow, orange-brown at base and along inner margin; apical third, costa, and outer margin black; three black fasciæ, one in end of cell, one between middle and lower median nervules, and the other below lower median nervule, the latter being more than twice the size of the others; hind-wing orange-brown, a wide black fascia extending from near base to beyond end of cell, a deeply indented wide marginal black border containing a row of yellowish spots.

Under-side as above but slightly paler.

Expanse 40 mm.

Hab. La Merced, Peru, 2500 ft., 1 ♂.

May be separated from *T. pais*, Hübn., by the three black fasciæ of the fore-wing, *T. pais* having a transverse black band; there is a specimen in Mr. Godman's collection from the Rio Napo.

Chamælimnas albivitta, sp. nov. (Plate XXVII, fig. 5.)

♂. Upper-side.—Fore-wing orange with wide black apex, costa and outer margin black, a fine black line extending from base along median nervure and lower median nervule to outer margin, a wider black line along sub-median nervure; hind-wing black with faint traces of a whitish fascia below cell.

Under-side.—Fore-wing as above but black line along median nervure only extending as far as origin of lower median nervule; hind-wing black with a long, narrow, white fascia extending from base to near outer margin.

Expanse 34 mm.

Hab. Espirito Santo, Brazil, 2 ♂♂.

Appears to be nearest to *C. similis*, Schaus., but may be distinguished by much greater extent of orange area of fore-wing. The second specimen differs slightly from

the one here described in having an orange fascia to the hind-wing above, and the black line on median nervure of fore-wing above not extending beyond origin of lower median nervure.

Caria fulvimargo, sp. nov. (Plate XXVII, fig. 6.)

♂. Upper-side.—Fore-wing brown, a basal patch of metallic green scales, and an inverted triangular patch of similar scales on costa, a transverse obscure dark line between these patches, the triangular patch outwardly bordered with a dark line, two parallel sub-marginal lines, the inner one silvery and the outer black and somewhat broken up, a dull red spot at apex; hind-wing brown with metallic green scaling along inner margin, a black bar closing cell and a discal black line beyond, outer margin fulvous except at apex and anal angle, this fulvous margin contains a row of minute black spots and is inwardly edged with metallic green.

Under-side.—Fore-wing brown, a dull red patch within cell surrounded by dark brown, three silvery spots one just beyond edge of red patch, one at apex, and the other nearer apical than basal spot, a transverse irregular blackish line beyond middle, an obscure dark line beyond this and traces of ochreous on the outer margin; hind-wing brown, three obscure dark spots on costa, a spot within and a bar closing cell, an irregular line beyond; outer margin ochreous except at apex, and containing minute black spots towards anal angle.

Expanse 32 mm.

Hab. La Merced, Peru, 2500 ft., 3 ♂♂.

Nearest *C. marsyas*, Godm., but is paler, has the metallic scaling reduced and the fulvous border to hind-wing.

Symmachia peruviana, sp. nov. (Plate XXVII, fig. 7.)

♂. Upper-side.—Both wings dark brown, crossed by several irregular faint dark lines; fore-wing with an obscure dark patch about middle of costa.

Under-side.—Fore-wing orange-brown, basal two-thirds of costa brown, inner margin widely brown; the following black bars; three within and one closing cell; four between median and sub-median nervures, an irregular discal row, and faint indications of two rows beyond this; hind-wing dark brown slightly reddish towards base, crossed by several rows of black bars which become obscure towards outer margin.

Expanse 31 mm.

Hab. La Merced, Peru, 2500 ft., 2 ♂♂ (type); Rio Colorado, Peru, 2500 ft., 1 ♂.

May be separated from *S. progne*, Godm., by the dark brown ground colour of the hind-wings below.

Lemonias pulchra, sp. nov. (Plate XXVII, fig. 8.)

♂. Upper-side.—Fore-wing greyish-blue, lower part of base brown, three black bars within cell, and three immediately below them, a sub-marginal black line widening at costa, outer margin black; hind-wing greyish blue, basal third brown, three black spots within cell and a curved irregular black line beyond, outer margin narrowly black; cilia white in interspaces of both wings.

Under-side.—Fore-wing dull bluish-grey, black markings as above, with an additional row of sub-marginal black spots; hind-wing dull bluish-grey with the following black markings; two spots at base, three beyond, and bar at end of cell, and three irregular rows of which the outer two are rather obscure.

Expanse 31 mm.

Hab. Rio Colorado, Peru, 2500 ft., 1 ♂.

Allied to *L. thara*, Hew., but has less brown and wants sub-marginal black spots on hindwing above.

Nymphidium completa, sp. nov. (Plate XXVII, fig. 9.)

♀. Upper-side.—Fore-wing dark brown crossed by a wide curved white band, three dark spots within and two below cell, all encircled with whitish, similar spots on outer margin, one between upper and middle median nervule, and two between lower median nervule and submedian nervure; hind-wing dark brown crossed by band as in fore-wing, a complete row of whitish encircled dark spots on outer margin.

Under-side.—Both wings as above but the base greyish, and the sub-marginal black spots more distinct.

Expanse 52 mm.

Hab. La Merced, Peru, 2500 ft., 2 ♀♀.

Nearest to *N. azan*, D. and H., from which it may be distinguished by the white band of fore-wing extending right up to costa.

Thecope fasciata, sp. nov. (Plate XXVII, fig. 10.)

♂. Upper-side.—Fore-wing purplish-blue, costa and outer margin black, an irregular black band from middle of costa to anal angle; hind-wing bright blue, narrowly black on costa and outer margin.

Under-side.—Both wings uniform dove colour; hind-wing with three sub-marginal black spots near anal angle, these spots inwardly pointed with white.

Expanse 38 mm.

Hab. ? 1 ♂.

Allied to *T. virgilius*, Fabr.; but the median black band of fore-wing above at once serves to distinguish it from this species. It will be seen from the figure that the specimen has lost part of its antennæ.

Explanation of Plate XXVII.

Fig. 1. *Eurygona subargentea*, sp. nov.
2. *Mesosemia elegans*, „ „
3. *Erycina latifasciata*, „ „
4. *Themone trivittata*, „ „
5. *Chamælimnas albivitta* „ „
6. *Caria fulvimargo*, „ „
7. *Symmachia peruviana*, „ „
8. *Lemonias pulchra*, „ „
9. *Nymphidium completa*, „ „
10. *Theope fasciata*, „ „

XVII. *A Classification of the Australian Lymantriadæ.*

By Dr. A. Jefferis Turner, M.D., F.E.S.

[Read May 4th, 1904.]

The *Lymantriadæ* are a group of interest as being the lowest family of the *Noctuid* series, which includes also the *Syntomidæ*, *Arctiadæ*, and *Noctuidæ* (of which I regard the *Agaristinæ* as a subfamily). They appear to have real relationship to the *Eupterotidæ*, the lowest family of the *Notodontid* series, comprising the *Geometridæ*, *Cymatophoridæ*, *Notodontidæ*, *Sphingidæ*, *Saturniadæ*, and *Bombycidæ*, the two series being readily distinguished by the point of origin of vein 5 of the fore-wings. In Australia the family is very well represented, and a classification of the Australian species should be of more than local interest. Col. Swinhoe's recent revision of the Old-World species in the British Museum collection, while useful as regards species, leaves the genera still in need of revision.

I have enlarged the extent of the family as usually understood by the inclusion under the subfamily name of *Asotinæ* of the group usually known as *Hypsidæ* or *Aganaidæ*. These are undoubtedly a natural group, but in all important structural characters they agree so closely with the *Lymantriadæ* as hitherto known, that I consider that they are best treated as a subfamily. The differences are no more than are present in the subfamilies of the *Noctuidæ*, *Geometridæ*, and *Pyralidæ* as these families are understood in Sir George Hampson's classification. There seems to me a tendency at present to create too many families among the bombycine moths. No doubt such division is practicable owing to the widespread extinction of intermediate forms among these archaic groups; but it appears to me more philosophical to group these together as subfamilies, wherever the indications of affinity appear sufficiently clear to justify such a course. The remainder of the family I have divided into two subfamilies, the *Lymantrianæ* and the *Anthelinæ* (type *Anthela*, Wlk.), the latter being distinguished by the very peculiar structure of the areole of the fore-wings,

and usually also by the wide separation of vein 8 of the hind-wings from the cell.

As this revision is limited to those species that I have been able to examine structurally, many species and possibly some genera are unavoidably omitted.

It will be noted that I have found no use for the following generic names—*Teia*, Wlk., *Urocoma*, Wlk., *Darala*, Wlk., *Colussa*, Wlk., *Chionophasma*, Butl., *Leptocneria*, Butl. Col. Swinhoe is, however, wrong in sinking the last named under *Anthela*; it belongs to a different section of the family, and I have regarded it as a synomym of *Lymantria*. *Teara*, Wlk., is now restricted to a single species, which belongs to the *Eupterotidæ*. *Asota*, Hb. (Verz., p. 164), has priority over the better known *Hypsa*, Hb. (Verz., p. 172).

Family LYMANTRIADÆ.

Fore-wings with vein 1c absent; 5 approximated at base to 4; 7, 8, 9 stalked; 10 connected by a bar or stalked with 9. Hind-wings with frenulum present; vein 1c absent; 8 usually connected or anastomosing with cell before middle.

A. Tongue present; thorax smooth. . . . . *Asotinæ*.

AA. Tongue absent; thorax densely rough-haired.

B. Fore-wings with areole moderate or absent; veins 8, 9 stalked from areole . . . . *Lymantrianæ*.

BB. Fore-wings with areole very long, reaching to near apex; veins 8, 9 arising separately from areole . . . . . *Anthelinæ*.

Subfamily *ASOTINÆ*.

Tongue well-developed. Thorax and coxæ smooth or slightly hairy. Fore-wings with areole present; veins 8 and 9 arising by a common stalk from areole. Hind-wings with vein 8 approximated to cell, and usually connected or anastomosing with it.

Mr. Meyrick (Proc. Lin. Soc. N.S.W., 1886, p. 758) has described the Australian species, and to his monograph I have little to add. I agree, however, with Sir George Hampson in referring *Rhodogastria*, Hb. (= *Amerila*, Wlk.), to the *Arctiadæ*. *Digama*, Moore, appears to me correctly referable here, the cross-bar between vein 8 and cell in the hind-wings having become obsolete as in many species of *Anthela*.

More recently, Mr. K. Jordan has published an elaborate paper on the *Asota* section of the group (Novit. Zool., 1896, p. 59); and Col. Swinhoe has catalogued the species of *Nyctemera* in the British Museum (Tr. Ent. Soc., 1903, p. 53). From both these papers I have derived help.

A. Hind-wings with 8 anastomosing shortly with cell near base.
  B. Palpi porrect or obliquely ascending; second joint short . . . . . 1. *Nyctemera.*
  BB. Palpi up-turned; second joint moderately long and closely appressed to frons . . . . . 2. *Argina.*
AA. Hind-wings with 8 not anastomosing with cell.
  B. Hind-wings with 8 approximated to cell, not connected . . . . . 3. *Digama.*
  BB. Hind-wings with 8 approximated and connected with cell.
    C. Palpi with terminal joint less than ½ second; ♂ without costal retinaculum . . . . . 4. *Agape.*
    CC. Palpi with terminal joint nearly as long or longer than second; ♂ with costal retinaculum . . . . 5. *Asota.*

Genus 1. Nyctemera.

Nyctemera, Hb., Verz., p. 178; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 759.

I am unable to follow Col. Swinhoe in rejecting this name in favour of *Deilemera,* Hb., as his action rests upon the assumption that the first-named species of a genus must be necessarily the type. There is some variability in the ♂ antennæ and the length of the terminal joint of the palpi in the Australian species, but I do not regard these points of generic value in this instance. Veins 6 and 7 of the hind-wings may be connate or stalked in the same species.

♂ antennæ with long pectinations :—

amica, White; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 760.
baulus, Bdv., Voy. Astrolabe Lep., p. 200.
  = *mundipicta,* Wlk., Journ. Lin. Soc., iii, p. 184; Swin., Cat. Oxf. Mus., i, Pl. v., f. 14.

= *fasciata*, Wlk., Brit. Mus. Cat., vii, p. 1665.
= *tertiana*, Meyr., Ent. Mo. Mag., xxiii, p. 15; Proc. Lin. Soc. N.S.W., 1886, p. 761.
secundiana, Luc., Proc. Lin. Soc. N.S.W., 1891, p. 280.

This differs from the preceding only in the hind-wings. Both forms are taken together in Northern Queensland, which suggests that they may be the same species; but in Southern Queensland only the present form occurs.

crescens, Wlk., Brit. Mus. Cat., xxxi, p. 204; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 761.

♂ antennæ with extremely short pectinations :—

separata, Wlk., Brit. Mus. Cat., xxxi, p. 204; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 762.
= *ægrotum*, Swin., Cat. Oxf. Mus., i, p. 145, Pl. v, f. 15.
= *mackieana*, Luc., Proc. Roy. Soc. Q., 1898, p. 60.

Genus 2. Argina.

Argina, Hb., Verz., p. 167; Hmps., Moths Ind., ii, p. 50.
cribraria, Clk.; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 763.

Genus 3. Digama.

Digama, Moore, Lep. E. Ind. Co., p. 297; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 772.
marmorea, Butl., Tr. Ent. Soc., 1877, p. 363; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 772.

Genus 4. Agape.

Agape, Snel., Tijd. v. Ent., xxxi, p. 115 (1888); Jord. Nov. Zool., 1896, p. 60.
chloropyga, Wlk., Brit. Mus. Cat., ii, p. 455; Feld., Reise Nov., Pl. 106, f. 4; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 771.

Genus 5. Asota.

Asota, Hb., Verz., p. 164; Jord., Nov. Zool., 1896, p. 203.
basilissa, Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 767.
dama, Fab.; Meyr. Proc. Lin. Soc. N.S.W., 1886, p. 768.
plagiata, Wlk., Brit. Mus. Cat., ii, p. 457; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 768.

caricæ, Fab.; Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 769.
iodamia, H.-Sch., Ausser. Schmet., f. 119.
= *nesophora*, Meyr., Proc. Lin. Soc. N.S.W., 1886, p. 770.

Subfamily *LYMANTRIANÆ.*

Tongue obsolete. Thorax and coxæ densely hairy. Fore-wings with areole moderate or absent, veins 8 and 9 arising by a common stalk from areole. Hind-wings with vein 8 approximated to cell, and connected or anastomosing with it.

A. Fore-wings without areole.
  B. Fore-wings with 7, 8, 9, 10 stalked (rarely 8 absent).
    C. Fore-wings with 7 arising from 8+9 before 10.
      D. Hind-wings with 4 absent . . . . . *Porthesia.*
      DD. Hind-wings with 4 present.
        E. Palpi short, porrect or obliquely ascending . . . . . *Euproctis.*
        EE. Palpi long, erect, reaching vertex . *Heracula.*
    CC. Fore-wings with 10 arising from 8+9 before 7 *Lymantria.*
  BB. Fore-wings with 7, 8, 9 stalked, 10 separate . *Caragola.*
  BBB. Fore-wings with 7 separate, 8, 9, 10 stalked *Haplopseustis.*
AA. Fore-wings with areole present.*
  B. Hind-legs without middle spurs . . . . . *Orgyia.*
  BB. Hind-legs with middle spurs.
    C. Fore-wings with 11 anastomosing with 12 . *Axiologa.*
    CC. Fore-wings with 11 free.
      D. Areole small, 10 connected with 8+9 well before 7, or rarely 10 free . . . . . *Iropoca.*
      DD. Areole moderate, 10 connected with 8+9 opposite 7.
        E. Abdomen crested at base of dorsum . *Olene.*
        EE. Abdomen not crested but densely hairy at base of dorsum . . . *Dasychira.*
        EEE. Abdomen neither crested nor densely hairy at base of dorsum.
          F. Fore-legs with tarsi densely hairy *Psalis.*
          FF. Fore-legs with tarsi not densely hairy . . . . . *Laelia.*

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* Sometimes absent in *Iropoca.*

Genus Porthesia.

Porthesia, Stph.; Hmps., Moths Ind., i, p. 484.
aliena, Butl., Tr. Ent. Soc., 1886, p. 386.
melanosoma, Butl., Ann. Mag. Nat. Hist. (5), ix, p. 87 (1882).
euthysana, Turn., Tr. Roy. Soc. S.A., 1902, p. 175.
panabra, Turn., Tr. Roy. Soc. S.A., 1902, p. 176.
galactopis, Turn., Tr. Roy. Soc. S.A., 1902, p. 176.
fimbriata, Luc., Proc. Lin. Soc. N.S.W., 1891, p. 285; Turn., Tr. Roy. Soc. S.A., 1902, p. 176.
lutea, Fab.; = *chrysophila*, Wlk., Brit. Mus. Cat., xxxii, p. 334; var. *iobrota*, Meyr., Tr. Roy. Soc. S.A., 1891, p. 194.
paradoxa, Butl., Tr. Ent. Soc., 1886, p. 385, may be a synonym of *virguncula*, Wlk., but is not the same as *panabra*, Turn., which may be distinguished by the elongate pale-ochreous scales on the dorsal margin of fore-wings.

Genus Euproctis.

Euproctis, Hb.; Hmps., Moths Ind., i, p. 470.
leucomelas, Wlk., Brit. Mus. Cat., iv., p. 838.
chionitis, Turn., Tr. Roy. Soc. S.A., 1902, p. 177.
lucifuga, Luc., Proc. Lin. Soc. N.S.W., 1892, p. 250. I think this is a form of *cervina*, Moore, Ann. Mag. Nat. Hist., 1877, p. 345, if not of *chrysophæa*, Wlk., Brit. Mus. Cat., xxxii, p. 324.
scotochyta, Turn., Tr. Roy. Soc. S.A., 1902, p. 178.
amphideta, Turn., Tr. Roy. Soc. S.A., 1902, p. 177.
holoxutha, Turn., Tr. Roy. Soc. S.A., 1902, p. 178.
crocea, Wlk., Brit. Mus. Cat., xxxii, p. 355.
arrogans, Luc., Tr. Roy. Soc. Q., 1899, p. 140; Turn., Tr. Roy. Soc. S.A., 1902, p. 179, = *mecki*, Druce, Ann. Mag. Nat. Hist. (7), xii, p. 222 (1903).

Col. Swinhoe regards this as synonymous with *crocea*, which is represented only by Walker's ♀ type from Moreton Bay, which has all the wings pale yellow. The present species, which is from North Queensland and New Guinea, differs in its deep reddish-ochreous colouring, as is noted in Dr. Lucas' description.

habrostola, Turn., Tr. Roy. Soc. S.A., 1902, p. 179, = *pura*, Swin., Tr. Ent. Soc., 1902, p. 405.

edwardsi, Newm., Tr. Ent. Soc., 1856, p. 284, = *togata*, Luc., Proc. Lin. Soc. N.S.W., 1891, p. 285.
baliolalis, Swin., Cat. Oxf. Mus., i, p. 215.
marginalis, Wlk., Brit. Mus. Cat., iv, p. 845.
limbalis, H.-Sch., Ausser. Schmet., f. 389.
niphobola, Turn., Tr. Roy. Soc. S.A., 1902, p. 179.
euryzona, Low., Tr. Roy. Soc. S.A., 1902, p. 213. This species is exceptional in having veins 3 and 4 of the hind-wings stalked; but this is also met with in other species as an occasional abnormality.

Euproctis leptotypa, n. sp.

[λεπτότυπος, lightly marked.]

♂. 23 mm., ♀. 32 mm. Head, thorax, and antennæ snow-white. Palpi in ♂ ochreous; in ♀ white. Abdomen white; tuft in ♀ ochreous. Legs white; anterior coxæ in ♂ ochreous anteriorly. Fore-wings snow-white; dorsal cilia faintly tinged with ochreous-fuscous in ♀; a narrow interrupted pale ochreous-fuscous fascia outwardly curved from ⅔ costa to ⅔ dorsum, in ♀ nearly obsolete; cilia snow-white. Hind-wings and celia snow-white.

Type in Coll. Turner.

North Queensland, Townsville, in July; three specimens received from Mr. F. P. Dodd, who bred them from larvæ feeding on a variety of *Acacia aulacocarpa*.

Euproctis ericydes, n. sp.

[ἐρικυδής, splendid.]

♀. 46 mm. Head, thorax, and palpi bright ochreous. Antennæ fuscous, shaft towards base ochreous. Abdomen black; tuft whitish-ochreous, under-side mixed with ochreous. Legs ochreous. Fore-wings black, with a clear yellow apical blotch; cilia black, on apical blotch yellow. Hind-wings bright orange; basal third black; cilia orange.

Type in Coll. Turner.

North Queensland, Geraldton (Johnstone River), in May; one specimen received from Mr. Horace Brown.

Genus Heracula.

Heracula, Moore, Proc. Zool. Soc., 1865, p. 804; Hmps., Moths Ind., i, p. 458.
leonina, Turn., Tr. Roy. Soc. S.A., 1903, p. 17.

Genus Lymantria.

Lymantria, Hb.; Hmps., Moths Ind., i, p. 459.

turneri, Swin., Tr. Ent. Soc., 1903, p. 484, = *aurora*, Turn., Tr. Roy. Soc. S.A., 1902, p. 181 (*præocc.*). This species may be only a form of *antennata*, Wlk., Brit. Mus. Cat., iv, p. 881. The ♀ has aborted wings. In the two following species the wings are developed equally in both sexes.

binotata, Butl., Tr. Ent. Soc., 1886, p. 386.

reducta, Wlk., Brit. Mus. Cat., iv, p. 888. In this species veins 6 and 7 of the hind-wings are usually but not invariably stalked.

Genus Caragola.

Caragola, Moore, Lep. Atk., p. 46; Hmps., Moths Ind., i, p. 489. (*Caviria*, Sect. ii.)

clara, Wlk., Brit. Mus. Cat., xxxii, p. 343; Hmps., Moths Ind., i, p. 490, = *collucens*, Luc., Proc. Lin. Soc. N.S.W., 1889, p. 1090.

Genus Haplopseustis.

Haplopseustis, Meyr., Tr. Ent. Soc., 1902, p. 34, = *Acnissa*, Turn., Tr. Roy. Soc. S.A., 1902, p. 180.

While doubt is permissible as to whether this genus should be referred to the *Noctuidæ*, as is done by Mr. Meyrick, I am on the whole inclined to regard it as an aberrant member of the *Lymantriadæ*.

erythrias, Meyr., Tr. Ent. Soc., 1902, p. 34, = *pyrrhias*, Turn., Tr. Roy. Soc. S.A., 1902, p. 180.

Genus Orgyia.

Orgyia, Ochs.; Hamps., Moths Ind., i, p. 436.

anartoides, Wlk., Brit. Mus. Cat., iv, p. 804, = *pusilla*, Butl., Ann. Mag. Nat. Hist. (5), ix, p. 88 (1882).

australis, Wlk., Brit. Mus. Cat., iv, p. 787 (♀), = *postica*, Wlk., Brit. Mus. Cat., iv, p. 803; Hmps., Moths Ind., i, p. 436, = *canifascia*, Wlk., Brit. Mus. Cat., xxxii, p. 325.

Genus Axiologa, nov.

[ἀξιόλογος, worthy of remark.]

Palpi moderate, hairy, porrect. Antennæ well pectinated in ♀. Thorax and abdomen not crested ; base of abdomen densely hairy above. Posterior tibiæ with two pairs of spurs. Fore-wings with 10 connected with 8 + 9 opposite 7 to form an areole ; 11 anastomosing shortly with 12. Hind-wings with 5 approximated at base to 4, 6 and 7 short-stalked, 8 anastomosing with cell before middle.

Founded on the anastomosis of veins 11 and 12 of fore-wings. As I have been able to examine only one specimen the constancy of this point requires confirmation.

pura, Luc., Proc. Roy. Soc. Q., 1891, p. 75.

Genus Iropoca, nov.

[εἰροπόκος, woolly.]

Palpi rather long (1½), projecting well beyond frons, densely hairy. Antennæ in ♂ with very long pectinations, in ♀ (not examined). Thorax and abdomen without crests ; abdomen densely hairy. Posterior tibiæ with two pairs of spurs. Fore-wings with veins 7, 8, 9 stalked, 10 arising from cell, sometimes connected with 8 + 9 well before 7 forming a very small areole. Hind-wings with 3, 4, and 5 arising separately from close to angle of cell, 6 and 7 short-stalked or connate, 8 connected with cell before middle. Female with wings aborted.

In four male examples two have a small areole in both fore-wings, and one in one fore-wing only; the fourth has vein 10 free on both sides.

rotundata, Wlk., Brit. Mus. Cat., iv, p. 851.

Genus Olene.

Olene, Hb. ; Hmps., Moths Ind., i, p. 452. (*Dasychira,* Section.)

mendosa, Hb.; Hmps., Moths Ind., i, p. 452. For synonomy see Tr. Roy. Soc. S.A., 1903, p. 17.

Genus Dasychira.

Dasychira, Stph. ; Hmps., Moths Ind., i, p. 447. (Section.)

horsfieldi, Saund. ; Hmps., Moths Ind., i, p. 448.

Genus Psalis.

Psalis, Hb.; Hmps., Moths Ind., i, p. 453. (*Dasychira*, Section.)

securis, Hb.; Hmps., Moths Ind., i, p. 453.

Genus Lælia.

Lælia, Stph.; Hmps., Moths Ind., i, p. 440.

This and the three preceding genera are closely allied. How far the points of distinction here given can be relied on must be decided by examination of the extra-Australian species.

obsolcta, Fab. = *crcmæa*, Meyr., Tr. Roy. Soc. S.A., 1891, p. 193.

ostracina, Turn., Tr. Roy. Soc. S.A., 1902, p. 181.

Subfamily *ANTHELINÆ*.

Tongue obsolete. Thorax and coxæ densely rough-haired. Fore-wing with areole very long, reaching to near apex; 8 and 9 arising separately from areole. Hind-wings with 8 usually widely separate from cell, sometimes connected with cell by a transverse bar.

A. Hind-wings with 8 touching cell base, then diverging . . . . . 1. *Redoa*.
AA. Hind-wings with 8 not touching cell after base.
  B. Hind-wings with 8 approximated to middle of cell.
    C. Fore-wings with areole simple . . . . 2. *Pterolocera*.
    CC. Fore-wings with areole divided by a veinlet . . . . . 5. *Chelepteryx*.
  BB. Hind-wings with 8 widely distant from mid-cell.
    C. Fore-wings with vein 5 from angle of cell . . . . . 3. *Nataxa*.
    CC. Fore-wings with vein 5 from well above angle of cell . . . . . 4. *Anthela*.

Genus 1. Redoa.

Redoa, Wlk., Brit. Mus. Cat., iv, p. 826; Hmps., Moths Ind., i, p. 487. (*Leucoma*, Section ii.)

I have not been able to examine the structure of the type (*submarginata*, Wlk.), but the following species has

not, I think, any close relationship to the genus *Leucoma*, Stph.

transiens, Wlk., J. Linn. Soc., vi, p. 128.

Genus 2. Pterolocera.

Pterolocera, Wlk., Brit. Mus. Cat., iv, p. 883.
amplicornis, Wlk., Brit. Mus. Cat., iv, p. 884.

Genus 3. Nataxa.

Nataxa, Wlk., Brit. Mus. Cat., v, p. 1179.
flavescens, Wlk., Brit. Mus. Cat., v, p. 1128. (♂.)
= *flavifascia*, Wlk., Brit. Mus. Cat., v, p. 1179. (♂.)
= *rubida*, Wlk., Brit. Mus. Cat., xxxii, p. 512. (♂.)
= *ochrocephala*, Feld., Reise Nov., Pl. 100, f. 2. (♀.)

Genus 4. Anthela.

Anthela, Wlk., Brit. Mus. Cat., iv, p. 853.

A large genus extensively developed in Australia, but not at present known from other regions. It will probably be found in New Guinea, and perhaps from more remote regions. Under this heading, I include *Darala*, Wlk., and *Colussa*, Wlk. The presence, or absence of a cross-bar between vein 8 of the hind-wings and the cell naturally suggests itself as a character of generic value. But I find that this point is variable in at least one species, and further material may show that it is variable in others also.

Vein 8 not connected with cell :—

Type *ferruginosa*, Wlk., Brit. Mus. Cat., iv, p. 854.
„ = *parva*, Wlk., Brit. Mus. Cat., iv, p. 892.
„ *heliopa*, Low., Tr. Roy. Soc. S.A., 1902, p. 214.
„ *occllata*, Wlk., Brit. Mus. Cat., iv, p. 887; H.-Sch., Ausser. Schmet., f. 506, 507.
„ *nicothoë*, Bdv.
„ = *australasiæ*, H.-Sch., Ausser. Schmet., f. 386.
„ = *adusta*, Wlk., Brit. Mus. Cat., iv, p. 897.
„ *replcta*, Wlk., Brit. Mus. Cat., iv, p. 896.
„ *denticulata*, Newm., Tr. Ent. Soc. (ii) iii., p. 283.
„ = *basigera*, Wlk., Brit. Mus. Cat., xxxii, p. 372.
„ = *undulata*, Feld., Reise Nov., Pl. 98, f. 11.
„ *neurospasta*, Turn., Tr. Roy. Soc. S.A., 1902, p. 182.

Vein 8 connected by bar with cell or free :—

Type *guenci*, Newm., Tr. Ent. Soc. (ii), iii, p. 284.

Vein 8 connected by bar with cell :—

Type *rubicunda*, Swin., Ann. Mag. Nat. Hist. (7), ix, p. 419.
„ = *phœnicias*, Turn., Tr. Roy. Soc. S.A., 1902, p. 182.
„ *pudica*, Swin., Ann. Mag. Nat. Hist. (7), ix, p. 419.
„ *uniformis*, Swin., Cat. Oxf. Mus., i, p. 210.
„ *aspilota*, Turn., Tr. Roy. Soc. S.A., 1902, p. 182. This is very distinct from *pudica*, Swin.
„ *asciscens*, Luc., Proc. Lin. Soc. N.S.W., 1891, p. 288.
„ *magnifica*, Luc., Proc. Lin. Soc. N.S.W., 1891, p. 286.
„ *acuta*, Wlk., Brit. Mus. Cat., iv, p. 889. A common and very variable species of which Walker and others have made many synonyms.
„ *excisa*, Wlk., Brit. Mus. Cat., iv, p. 889. The same remark applies to this species, which ranges from North Queensland to Tasmania. It is best distinguished from the preceding by the white-centred discal dots of the fore-wings.
„ *consors*, Wlk., Brit. Mus. Cat., xxxii, p. 369. Misspelt *ccnsors*, which is corrected, *ibid.*, xxxv, p. 1917.
„ *cancscens*, Wlk., Brit. Mus. Cat. iv, p. 901. The West Australian representative of the group to which the three preceding species belong, and like them very variable.

Anthela symphona, n. sp.

[*σύμφωνος*, harmonious.]

♀. 54 mm. Head and palpi ochreous-brown. Antennæ white. Thorax grey, anteriorly tinged with ochreous-brown. Abdomen pale grey. Legs grey, coxal hairs tinged with ochreous. Fore-wings triangular, costa nearly straight, apex rounded, termen bowed, oblique; dark grey becoming blackish towards base ; a broad whitish costal streak from base to apex, crossed by three fuscous lines corresponding to those across disc ; an outwardly curved whitish transverse line at $\frac{1}{5}$; a more distinct white line from $\frac{2}{3}$ costa, obtusely bent beneath costa to mid-dorsum ; a parallel whitish line from $\frac{5}{6}$ costa to $\frac{3}{4}$ dorsum ; a series of faintly darker terminal spots ; cilia whitish. Hind-wings with termen rounded ; vein 8 free ; pale grey ; with faint whitish transverse lines at $\frac{1}{3}$ and $\frac{3}{4}$; cilia whitish. Underside grey with a postmedian curved dark fuscous transverse line,

and two blackish white-centred discal spots in each wing before and at middle.

Type in Coll. Turner.

TASMANIA, Hobart; one specimen received from Mr. A. M. Lea.

ANTHELA ACHROMATA, n. sp.

[ἀχρώμᾰτος, colourless.]

♂. 34–40 mm. Head, thorax and abdomen whitish-grey. Palpi reddish-brown; apices ochreous. Antennæ whitish; pectinations ochreous-fuscous. Legs whitish-grey, anteriorly reddish. Fore-wings broadly triangular, costa nearly straight, apex rounded, termen rounded, slightly oblique; whitish-grey; costal edge narrowly reddish; an outwardly curved fuscous antemedian line, sometimes interrupted to form a series of dots, from $\frac{2}{5}$ costa to $\frac{1}{3}$ dorsum; a similar postmedian line from $\frac{4}{5}$ costa to $\frac{2}{3}$ dorsum; a well-marked median discal fuscous dot; cilia concolorous. Hind-wings with termen rounded; vein 8 connected by a bar with cell; colour and markings as fore-wings, but antemedian line and discal dot not developed. Under-side similar but antemedian line of fore-wings absent.

Type in Coll. Turner.

NORTH QUEENSLAND, Thursday Island, Cairns, Herberton; three specimens, of which two are in the Queensland Museum.

Genus 5. CHELEPTERYX.

Chelepteryx, Gray, Tr. Ent. Soc., i, p. 122; *Chalepteryx*, Wlk., Brit. Mus. Cat. iv, p. 913.

collesi, Gray, Tr. Ent. Soc., i, p. 122; Wlk., Brit. Mus. Cat., iv, p. 914.

felderi, nom. nov.

= *Darala chalepteryx*, Feld. (following Walker's misspelling), Reise Nov., Pl. 98, f. 10. As this species is congeneric with the preceding, it becomes necessary to change the specific name.

XVIII. *Notes on Maternal Instinct in* Rhynchota.

By Frederick P. Dodd. Communicated by Oliver Janson, F.E.S.

[Read March 16th, 1904.]

Plate XXVIII.

Mr. Kirkaldy's very interesting notes upon this subject, in the "Entomologist," remind me that about the month of June, 1901, I took a large oval, flat, and pale-green bug upon one of our so-called "Bitter Barks" (*Petalostigma quadriloculare*). Adhering to her abdomen underneath were three or four young ones, certainly several days old; these dropped off several hours after, when placed in the killing bottle. Subsequently I sent these specimens, with some miscellaneous material, to Mr. W. W. Froggatt, supplying him with the particulars mentioned; but as he did not even refer to the bugs when acknowledging the parcel, I naturally assumed that my discovery was unimportant. There were more of the insects upon the trees at the time, but I was not interested in them then, and contented myself with the single old one. I searched the trees carefully later, but the long-continued drought of 1901–2 appears to have caused the extinction of the species here. However, I determined to keep a sharp look-out in the hope of meeting with another affectionate bug, and ere long I was rewarded by noticing a female of the large, rather common, and widely-distributed species, *Tectocoris lincola*, var. *banksi*, Don., standing over a cluster of about sixty eggs. I observed her closely for several days, and then took her and the ova home. At the end of a fortnight she abandoned the eggs, and flew about my room, but none hatched; they had been interfered with before I took them, some had disappeared and others seemed to have been punctured. Meantime I had discovered a patch of shrubs, in a locality which I rarely visited, where these bugs were fairly plentiful, amongst them being about fifteen females protecting their egg-clusters. Eventually, June 28th, 1903, I found one bug depositing, and

watched her place several eggs against a number already laid. I paid particular attention to this insect, visiting her myself every second or third day, and sending a boy to the spot when I did not go. The twenty-third day was missed, but upon the twenty-fourth (July 22nd, 1903) the little ones were out, and grouped a couple of inches above the egg-shells, and the parent had moved a little below; this is quite usual, as the young ones begin to break through, the mother backs an inch or so away from the egg mass and stays there for some hours (long after the last egg has hatched), when she departs, leaving the small bugs to take care of themselves. The young are scarlet when they emerge, but within a couple of hours they become banded with blue-black, in a few days they have changed to almost wholly deep bluish-green, with several small, dull reddish patches; there is then little alteration in their colour until they are full grown.

The eggs number from about sixty to one hundred; they are of a rich salmon colour when deposited, but in a few days commence to assume a dull purplish tint. For some days the larvæ group in a mass when at rest, at times in a slightly conical heap, and keep much together until well grown.

Apparently the mothers never leave their eggs temporarily, any that I have met with unprotected were quite abandoned. At different times I had altogether about twenty mother bugs, and they generally remained faithful to their charges; when one did depart before the young emerged it was doubtless owing to my presence; for they were upon my table, and my coming and going, and various movements, naturally would have the effect of disturbing them. After leaving, a mother would not mount guard again, no matter how gently I induced her to walk upon the twig she had left.

It is absolutely certain that the "broody" bugs remain foodless during the whole period of three weeks or more of "sitting," they occupy the same position always, and various investigations have failed to reveal any punctures in the twigs in front of them; moreover, there were several mothers with eggs upon small trees close to the food plants, two of which were hard-wooded eucalypts, without tender shoots at the time; the sap of these, even if it were tapped by the beaks of the insects, would scarcely be to their taste. Two of the females which I

brought home were upon tough eucalyptus twigs, these and other twigs I allowed to become dry, but the mothers stayed on and the eggs duly hatched. June and July are our coldest months, but the bugs feed and move freely about, and cannot be called sluggish; they are more plentiful in the autumn and winter than during the summer. I have not seen one since August, it is now December. I shall endeavour to ascertain whether there are summer broods, and, if so, the length of time the eggs require to hatch out. Summer extends to the end of March.

As already stated the position of the insect never alters as she stands above the eggs—the forelegs are clasped around the twig in front of them, the third pair holds it just behind, and the middle pair clasps them about the centre, so that they are effectually shielded above; they are placed in rows all round the twig.

In approaching a sitting bug, or pushing any object near her, from the side, she inclines her body towards the threatening quarter, or exhibits much concern if the hands, say, are held near, and moved about her; it is most absurd to watch her determined efforts to shield the precious eggs; she sidles to the right or left, as the case may be, to meet the supposed danger, but no menacing in front or behind will induce her to move.

Though I have seen males in front of the sitting females, and evidently causing them annoyance, it did not appear that they ever attempted to interfere with the eggs, though it is quite likely that they were intent upon mischief. As I have frequently had ova of Hemiptera produce ichneumons, it may be that the patient protection afforded by these females is, in some measure, to keep these insects away; none of the eggs of this species which I had were parasitised.

The insects are generally found upon soft-wooded or juicy-leaved plants, and they specially relish those belonging to the Malvaceæ, the common cultivated "Rosella" being often attacked by them, so that they may become a pest in gardens occasionally.

To illustrate these notes I have selected various mother bugs and eggs *in situ*, empty egg-shells, larvæ emerging, just out, and out for two hours, also larvæ of various ages, and several of the perfect insects, showing their extraordinary variability of colour and markings.

Explanation of Plate XXVIII.

Fig. 1. *Tectocoris lineola*, var. *banksi*, Don., ♀, "brooding" over a cluster of eggs.

2. „ „ „ , eggs and recently emerged larvæ.

3. „ „ „ , empty egg-shells, and larvæ two hours old.

4–8. „ „ „ larvæ of various ages.

9. „ „ „ ♀, upper view of the insect shown in fig. 1.

10–14. „ „ „ ♂, showing the great variability in colour.

XIX. *A Note on* Elymnias borneensis, Wallace. By Robert W. C. Shelford, M.A., F.L.S., C.M.Z.S. With a Note by Colonel Charles T. Bingham, F.Z.S.

[Read March 2nd, 1904.]

There has been much confusion over this species, which was first described from a female specimen by Dr. A. R. Wallace in 1869 (Trans. Ent. Soc. Lond., p. 324); in 1887 Staudinger figured what he supposed to be the male (Exot. Schmett., Pl. 86), but Fruhstorfer in 1899 (Berl. Ent. Zeitschr., xliv, p. 57) rightly pointed out that Staudinger's figure is that of a female; however, he then goes on to state that the true male is "ganz blau und gehört mit *mehida*, Hew., und *sumatrana*, Wall., zusammen in eine andere Gruppe und zwar in das sub-genus *Bruasa*, Moore." Now this is entirely wrong; the male alluded to by Fruhstorfer is the *E. borneensis* of Grose-Smith described in 1892 (Ann. Mag. N. H., p. 428), the female of which resembles the females of the other species of the sub-genus *Bruasa*; none of them are Pierine mimics as is *Elymnias borneensis* ♀, Wall.

What then is the male of Wallace's species? It is the butterfly wrongly termed *Elymnias esaca*, Westwood (Borneo). The type of *E. esaca*, Westw., was originally recorded as from the "East Indies," and the locality "Assam" subsequently quoted in some works on Oriental Lepidoptera appears to be quite erroneous; *E. esacoides*, de Nicév., from Perak and Sumatra is, judging from specimens in the British Museum, identical with *E. esaca*, Westw., and *E. godfreyi*, Dist., from the Malay Peninsula and Sumatra is, in all probability, the female of the species. *E. esaca*, Westw., belongs to the sub-genus *Agrusia*, Moore, and the other species of the sub-genus are *E. leontina*, Fruhst., *E. maheswara*, Fruhst., *E. andersoni*, Moore, *E. egialina*, Feld., and *E. borneensis*, Wall. All the males of this sub-genus are black on the upper-side with a sub-marginal row of green maculæ on both fore- and hind-wings (in *E. borneensis* the maculæ on the hind-wing are obsolescent); the under-side is cryptically coloured, being dark fuscous mottled and freckled with lighter

markings; the females, so far as they are known, are Pierine mimics. The males of some species are fairly close mimics of such species of Euthalia (sub-genus *Cynitia*, Moore) as *eocytus*, Fab., and *lepidea*, Butl., which have the broad band on the hind-wings of a greenish tinge; *Elymnias andersoni*, Moore, from the Mergui Archipelago, has the maculæ on the upper-side of a bluish-green, judging at any rate from Moore's figure (Lepid. Ind., vol. ii, Pl. 143, figs. 2 and 2a), and in general appearance the insect approximates to *Euthalia andersoni*, Moore, from the same locality, a species with a pale-blue band to the hind-wing above. *Elymnias borneensis*, Wall., ♂, is not at all like any of the pale-blue banded *Cynitias* of Borneo, and I do not consider it to be a mimetic form. In the males of *Elymnias borneensis* and *E. esaca* there are two or three red spots at the base of the hind-wing below; perhaps in this sex these spots serve to increase the cryptic character of the under-side of the wing (though it is difficult to see how this can possibly be the case), but it is interesting to note that in the females of these two species these basal red spots play a most important part in increasing the resemblance to a Pierine such as *Delias pardemia*, which is similarly provided with red spots on the fore-wing below. The males of *Elymnias andersoni*, *E. leontina*, and *E. maheswara* are not provided with the basal red spots, but the female of *E. maheswara* has quite a large basal red area and is a good Pierine mimic; the females of the other species are not known. It is impossible to state definitely whether the red spots in the male are ancestral characters that have been lost by *E. andersoni*, *E. maheswara*, etc., or whether they are characters newly acquired by the males of *E. esaca* and *E. borneensis*, but since the female *maheswara* is a much closer Pierine mimic than the females of *esaca* and *borneensis* it is presumably a more highly-evolved form; so that the evidence, poor though it is, points to the conclusions: (i) that the red spots in the male are ancestral characters retained by the less highly-specialised forms, lost in the more specialised forms; (ii) that in the female these ancestral characters being of the highest importance in producing a Pierine appearance are more developed in the higher forms than in the lower; or, in other words, in the male sex the basal red spots tend to disappear, in the female sex they tend to increase *pari passu* with increased specialisation.

The following table shows what I believe to be the true relationships between the different forms :—

Sub-genus Agrusia.

Name of Species.	Distribution.	Remarks.
Elymnias esaca, Westw. (= *E. esacoides*, de N.).	Sumatra and Malay Peninsula.	♀ = *E. godferyi*, Dist. Male with red spots.
Elymnias esaca andersoni, Moore.	Mergui Archipelago.	♀ not known. ♂ a fair mimic of *Euthalia andersoni*, Moore. Male without red spots.
Elymnias esaca leontina, Fruhst.	Nias.	♀ not known. ♂ without red spots.
Elymnias esaca borneensis, Wall.	Borneo.	♂ with red spots.
Elymnias maheswara, Fruhst.	Java (Mt. Gede).	♂ without red spots. ♀ highly specialised.
Elymnias egialina, Feld.	Philippines.	♂ without red spots. ♀ not known.

I may add that I have proposed (Journ. Roy. As. Soc. Straits Br., No. 41, p. 104, 1904) the new name *trepsichroides* for the *E. borneensis* of Grose-Smith; the confusion over these species was made greater when Mr. Grose-Smith described the female of his *Elymnias konga* as the female of his *E. borneensis*. The true female of *E. trepsichroides* is described by me (l. c., p. 104).

Note on Mr. Shelford's paper on Elymnias borneensis, Wallace.

Mr. Shelford's contention that *E. esaca*, Westw., is the male of *E. borneensis*, Wall., is quite borne out by the specimens of *E. esaca* in the collection of the British Museum.

Further comparing the type of *E. esaca*, which is a male with the description and figure of *E. esacoides*, de Nicéville (Jour. Bomb. N. H. Soc., 1892, p. 323, Pl. H, fig. 2), there can be no reasonable doubt that *E. esacoides*, de Nicéville =

E. esaca, Westwood. Both have the red spots (unaccountably omitted in Hewitson's figure of *E. esaca*, Ex. Butl. iii, Melanitis, Pl. 1, fig. 5) on the under-side of the hind-wing near the dorsal margin. These spots are perhaps a little larger in de Nicéville's figure than in the type specimen, but that is all; for the rest marking for marking the two are identical.

Again comparing Wallace's description of *E. borneensis*, the type of which was a female, with a female specimen in the British Museum collection labelled *E. godfreyi*, which agrees with the figure in Distant's *Rhop. malayana*, it seems to me clear that *E. godfreyi*, Distant, must also be sunk as a synonym of *E. esaca*, Westwood.

C. T. Bingham.

XX. *On three collections of* Rhopalocera *from Fiji, and one from Samoa.* By Gustavus A. Waterhouse, B.Sc., B.E., F.C.S.

[Read June 1st, 1904.]

Having received during the last year several collections of butterflies from the South Sea Islands, to all of which localities were attached, and to most of which dates were added, I have thought it well to draw up a list, and at the same time add a few notes of comparison with allied Australian species.

In 1886, Mr. T. Steel, F.C.S., F.I.C., made a collection of eight species at Nausori on the Rewa River, Viti Levu.

During December 1902, Mr. T. Guthrie, Ph.D., made a collection consisting of ten species at Lautoka, Viti Levu.

During 1903 my brother, Mr. E. G. Waterhouse, B.A., visited Fiji and Samoa and brought back a large number of specimens. The localities he visited in Fiji were Bua, Vanua Levu (22nd May to 4th June), and Navaloa, Viti Levu (9th to 11th June). In Samoa his dates were Apia (16th to 18th June), Lufilufi (19th to 22nd June), and Satapouala (4th July) on the island of Upolu; Satapaitea (27th June to 1st July) and Salilalonga (2nd July) on the island of Savaii.

Of previous papers on these islands we have those of Herrich-Schäffer (Stett. Ent. Zeit., 1869, pp. 65–80) and Butler (P.Z.S. 1874, pp. 274–281, and 1875, pp. 619, 620; Ann. Mag. Nat. Hist., 1884, pp. 343–348), while in 1892 Mr. H. H. Druce (P.Z.S., pp. 434–446) gave an account of the *Lycænidæ* of the South Pacific.

I have followed the nomenclature used in my catalogue of the *Rhopalocera* of Australia * in my comparisons with Australian forms.

Anosia menippe, Hübner.

Nausori, ♂ ♀. Lautoka, 3 ♂. Lufilufi, ♂. Satapaitea, ♀.

I can detect no difference between Fijian and Samoan specimens, nor do they differ from Australian specimens, nor from figures of the North American insect.

* Memoirs of the N.S.W. Naturalists' Club, No. 1, 1903.

Limnas petilia, Stoll.

Lautoka, ♂ ♀.

These are identical with Eastern Australian specimens. I have seen no previous record of this from Fiji.

Tirumala mellitula, Herrich-Schäffer.

Lufilufi, 9 ♂, 1 ♀. Satapaitea, 2 ♂.

There is little to distinguish this species from the Australian *T. hamata*, Macl., excepting its much smaller size.

Nipara eschscholtzii, Felder.

Lautoka, ♂. Bua, ♂. Navaloa, ♂.

Calliplœa forsteri, Felder.

Nausori, 2 ♂.

From the allied Australian *C. tulliolus*, Fabr., this form differs by having the blue sheen of the fore-wing more extensive, the row of white spots of the fore-wing both above and below not so large, especially towards the costa.

Deragena proserpina, Butler.

Nausori, ♂. Navaloa, 2 ♂. Bua, ♀.

These specimens agree with Felder's figure of *E. herrichii*, which is given as a synonym by Butler and Moore.

Deragena schmeltzii, Herrich-Schäffer.

Satapaitea, 4 ♂. Lufilufi, ♂. Apia, ♀.

I have some little doubt as to the correctness of this determination.

Acræa andromacha, Fabr.

Lautoka, ♀.

The single Fijian specimen only differs from Australian specimens in having the submarginal row of pale spots in the hind-wing larger, and the black spots on the disco-cellulars of the hind-wing absent.

Atella bowdenia, M. R. Butler.

Satapaitea, ♂. Lufilufi, 3 ♂. Apia, ♂.

This sub-species of *A. egista*, Cram., is much smaller, and paler in colour both above and below than the Australian form.

Junonia villida, Fabr.

Lautoka, ♂ ♀. Bua, 2 ♂. Lufilufi, ♂. Satapaitea, 2 ♂ ♀. Satapouala, ♂.

In the Australian form the yellowish-red rings of the hind-wing are usually separated by a brown bar; in Fijian specimens, which are smaller, this bar is linear, and the reddish colour is darker. Samoan specimens average about half the size of Australian, are very much darker in colour, and the encircling rings are joined to form continuous bands in the hind-wing.

Hypolimnas bolina, Linn.

This species was received in considerable quantities from all the localities visited, females greatly predominating. The males showed no variation from the ordinary form found in Australia, excepting in their somewhat smaller size. On the other hand, no two females were alike amongst about twenty specimens from Fiji; in colour some were nearly white, others brown, and others a beautiful reddish brown; the whitish band from the costa to the outer margin of the fore-wing was as often absent as present; the central patch of the hind-wing was in one instance blue, in others white or reddish, and in several cases entirely absent. Considering that *only one form of male* was obtained, I think it undesirable to admit even sub-specific rank for any of the female forms found in Fiji. In Samoa this species was also very plentiful, and much smaller in size, and only varied in the amount of red on the upper-side in the females.

Xois sesara, Hew.

Lautoka, ♂ ♀. Nausori, ♀. Bua, ♂ ♀. Navaloa, ♂.

At Bua this species was very plentiful.

Melanitis leda, Linn.

Nausori, 2 ♂, 4 ♀. Satapaitea, 2 ♂ ♀. Lufilufi, ♀. Salilalonga, 3 ♂. Lautoka, ♂.

All the specimens obtained were ocellated forms. I am of opinion that *M. leda* is much better regarded as an extremely variable species, than as a number of locally distinct forms. Some of my Fijian specimens are identical with Australian, of which I have examined considerably over one hundred specimens without being able to detect any character that is not subject to variation.

Zizera labradus, Godt.

Bua, ♂ ♀. Navaloa, ♂ ♀. Apia, ♂ ♀. Lufilufi, ♂ ♀. Satapaitea, ♂ ♀.

Very common. I have this species from the New Hebrides and a great number of specimens from Eastern Australia from localities ranging from Cape York to Victoria, and find it variable as to size and coloration. I have Australian specimens identical with Butler's figure of *Z. caduca*,* and have no doubt that Druce was quite correct in considering it as a synonym of this species. My New Hebrides specimens are hardly different from some Australian specimens.

Zizera alsulus, Herrich-Schäffer.

Lufilufi, 3 ♂. Satapaitea, 4 ♂, 2 ♀.

I have already shown † that I consider that this is the older name for Mathew's *Lycæna lulu*.

Nacaduba samoensis, H. H. Druce.

Satapaitea, ♀.

Jamides woodfordi, Butler.

Bua, ♂ ♀.

Common. Unfortunately this species has not been figured, but I have little doubt that my determination is correct.

* P. Z. S., 1875, p. 616.
† Proc. Linn. Soc. N. S. Wales, 1903, p. 212.

Jamides carissima, Butler.

Lufilufi, ♂ ♀. Satapaitea, ♂ ♀.

Common.

Catochrysops cnejus, Fabricius.

Bua, 4 ♂ ♀. Lufilufi, 2 ♂ ♀. Satapaitea, 3 ♂ ♀. Lautoka, ♀.

These specimens are much smaller than the Australian form and have the ground colour somewhat whiter.

Catochrysops platissa, Herrich-Schäffer.

Satapaitea, 8 ♂, 2 ♀. Lufilufi, 11 ♂, 3 ♀.

Terias hecabe, Linn.

Nausori and Bua.

Common.

Padraona angustula, Herrich-Schäffer.

Nausori, ♂. Bua, ♂.

XXI. *On the Geometridæ of Tropical Africa in the National Collection.* By Colonel Charles Swinhoe, M.A., F.L.S., etc.

[Read June 1st, 1904.]

Very little work has been done with the Geometridæ of Tropical Africa. This paper is merely an attempt to lay a foundation for future workers; very much more material is necessary than has been at my disposal, before any decision can be come to as to the sub-division of the African genera; many of them are very abnormal; the Genus *Terina* used to stand in the family *Nyctemeridæ* (Deilemerinæ) as also did *Aletis* and *Pitthea*; the last-named is a true Boarmid about which there can be no mistake; *Terina* and *Aletis* I have put in the *Orthostixinæ*; I submitted examples of the latter to Mr. Meyrick and to Mr. Warren, and they both agree that that is its right place; amongst the Sterrhidæ there are apparently several good sub-genera in the Craspedia group, all of them so exactly resembling each other in coloration and pattern as to be indistinguishable from each other except by their anatomical characters; in one species of *Pisoraca*, the type of which is an African insect, only the hind femora are clothed with curled hairs, but in other species, though they are true *Pisoraca* in so far as the spur of the hind-tibia is concerned, the hind-tibia is also clothed on the inner side with a dense brush of hairs, which almost conceals the single spur; many African *Larentiinæ* have vein 5 of the hind-wings well above the centre of the discocellulars.

I have added to this paper a list of species not in the National Collection, and I have tried to include every species published up to date, as it will be of very great help to those that come after me; I have not included any species confined to South Africa because Sir George Hampson is working out the Heterocerous Fauna south of the Zambesi.

Family BOARMIINÆ.

Genus HYPHENOPHORA, Warr., Nov. Zool., i, p. 402 (1894).

HYPHENOPHORA PALUMBATA.

Hyphenophora palumbata, Warr., l. c.

1 ♀, Onitaba, River Niger.
The type, a male from the same locality, is in coll. Rothschild.

HYPHENOPHORA CONSPERSATA.

Pareumelia conspersata, Kirby, Ann. Mag. N. H. (6), xviii, p. 395 (1896).

1 ♂, Port Alice, W. Africa (type).
Very close to *H. perlimbata*, Guen.

HYPHENOPHORA ÆMONIA, nov.

♀. White with a grey centre; head, thorax, and wings dark grey with a faint greenish tinge, striated with darker grey, more especially in the basal half, which is paler than the outer part; it is limited by a white distorted band, which runs from the middle of the abdominal margin across the hind-wings where it thickens, and is so continued a short way up the fore-wings where it is oblique, and is continued in the form of small dots towards the apex before which it is bent round; there is a black dot at the end of each cell, a dark suffusion on the outer side of the white band, and a dark macular band across the disc of the hind-wings, even with the outer margin; under-side, body, legs, and wings pure white; a black dot at the end of each cell, no other markings.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. KAMPALA, Uganda, Feb. 6, 1900 (*H. B. Rattray*).

HYPHENOPHORA PERLIMBATA.

Palyas perlimbata, Guen., Phal., i, p. 396 (1857).
„ „ Walker, xxii, 613 (1861).

1 ♂, Sapele, Niger River. 2 ♂, Old Calabar. 1 ♂, Sierra Leone.

Genus RHAMIDAVA, Walker, xxvi, 1568 (1862).

Traina, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 372 (1869).

Rhamidava fulvata.

Phalæna fulvata, Drury, Ins., iii, pl. 21, f. 4 (1773).
Rhamidava fulvata, Walker, xxvi, 1568.

5 ♂, 3 ♀, Sierra Leone.

Rhamidava stramineata.

Traina stramineata, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 372, pl. 7, f. 12 (1869).

1 ♀, Congo (type). 2 ♂, Old Calabar.

Rhamidava amplissimata.

Acidalia (?) *amplissimata*, Walker, xxvi, 1614 (1862).

1 ♀ (type) without locality. 2 ♂, Old Calabar.

Genus Melinoessa, Herr.-Schäff., Ausser. Schm., p. 31 (1855).
Timana, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 373 (1869).
Obrussa, Saalm., Lep. Madag., p. 498 (1884).

Melinoessa cræsaria.

Melinoessa cræsaria, Herr.-Schäff., l. c., pl. 65, f. 370.
Rhamidava sodaliata, Walker, xxvi, 1568 (1862).
Timana costalis, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 373, pl. 7, f. 13.

1 ♂, Sierra Leone (type *sodaliata*). 1 ♂, Congo (type *costalis*.)

Herrich-Schäffer erroneously described this insect as from Sylhet; the genus does not occur in India.

Melinoessa stellata.

Eumelia stellata, Butler, Ann. Mag. N. H. (5), ii, p. 464 (1878).
Obrussa catenata, Saalm., Lep. Madag., p. 498, f. 268 (1884).

2 ♂, 1 ♀, Old Calabar, including the type. 2 ♂, 2 ♀, Sapele, River Niger.

Genus Neostega, Warr., Nov. Zool., x, p. 276 (1903).

Neostega flaviguttata.

Neostega flaviguttata, Warr., l. c.

3 ♂, 1 ♀, Sierra Leone. 1 ♀, Old Calabar.
The type, a male from Oguta, Niger, is in coll. Rothschild.

Genus Stegania, Guen., Dup. Cat. Lep. Eur., p. 270 (1884).

Heterostegane, Hmpsn., Ill. Het., ix, p. 143 (1893).
Hydatocapnia, Warr., Nov. Zool., ii, p. 143 (1895).

Stegania pleninotata.

Heterostegane pleninotata, Warr., Nov. Zool., viii, p. 15 (1901).

6 ♂, Sierra Leone.
The type, a female from Sierra Leone, is in coll. Rothschild.
In Cat. Het. Mus. Oxon., ii, p. 238, I sank *Stegania* to *Lomographa*, Hübner, by mistake. Mr. Warren has pointed out to me that the true type of *Lomographa* is *bimaculata*, Fabr. = *taminata*, Schiff., from Europe, and as this species is the type of *Coryeia*, Dup., and *Bapta*, Steph., it will sink them both.

Stegania minutissima, nov.

♀. Pale greyish-ochreous, both wings uniformly but sparsely striated with darker ochreous; a brown point at the end of each cell; costal line of fore-wings ochreous-brown, and an ochreous-brown submarginal band more or less interrupted in its middle on both wings.
Expanse of wings $\frac{6}{10}$ inch.

Hab. Tonga, Brit. E. Africa (*Hollis*).

Stegania fumosa.

Hydatocapnia fumosa, Warr., Nov. Zool., iv, p. 78 (1897).

2 ♀, Old Calabar.
The type, a female from Warri, is in coll. Rothschild.

STEGANIA RUBIDA, nov.

♀. Orange-red; the ground-colour of the wings is yellow, thickly irrorated and striated with orange-red very uniformly; a white spot with a black point at the end of each cell; indications of an inner band of darker red on the fore-wings; a medial fairly even band across both wings, also a dentated outwardly curved discal band; in the fore-wings this band is joined to the hinder angle by a red mark; there is also a short subapical similar mark or band; both wings with marginal lunular marks; under-side of a uniform pale red, with the bands faintly indicated.

Expanse of wings 1 inch.

Hab. MADAGASCAR (*Cowan*).

Genus XENOSTEGA, Warr., Nov. Zool., vi, p. 301 (1899).

XENOSTEGA TINCTA.

Xenostega tincta, Warr., l. c., p. 302.

3 ♂, Sapele, River Niger.

The type, a female from Warri, is in coll. Rothschild.

XENOSTEGA SINNA, nov.

♀. Dull pale red, the ground-colour of the wings yellow thickly irrorated with dull red; the centre of both wings least irrorated, leaving the resemblance of a rather broad but indistinct transverse band across the fore-wings and down the middle of the hind-wings, the space beyond on both wings being darker than the rest of the wings; marginal points red-brown, cilia yellow; the under-side is pale purplish-brown with a broad yellow band across both wings.

Expanse of wings $\frac{9}{16}$ inch.

Hab. OLD CALABAR (*Crompton*).

Allied to *X. tincta*, Warren, looks somewhat like it above, but is very dissimilar on the under-side.

XENOSTEGA TYANA, nov.

♀. Yellow; frons with some chestnut-coloured marks; abdomen with chestnut-brown bands; both wings with a broad dull chestnut-brown medial band, occupying quite a third of the wing space, limited on each side by a brown line, the line on the outer side accompanied by yellow spots; an indistinct thick brownish line from above the middle to the outer margin on both wings; under-side yellowish-white, nearly pure white; some grey suffusion in the centre

of both wings, and a dark grey thin submarginal band, throwing a thin band out towards the margin as on the wings above.

Expanse of wings $\frac{8}{10}$ inch.

Hab. Old Calabar (*Crompton*).

Genus Scardamia, Guen., Phal., i, p. 89 (1857).

Scardamia maculata.

Scardamia maculata, Warr., Nov. Zool., iv, p. 240 (1897).
„ ab. *decolor*, Warr., l. c., ix, p. 519 (1902).

1 ♀, Munisu, Brit. E. Africa. 3 ♀, E. Quaso. 1 ♀, mile 478, Uganda Railway.

The type, a female from Dar-es-Salaam, German East Africa, and the type of *decolor*, a male from the Escarpment, Brit. E. Africa, are in coll. Rothschild.

A very variable insect; at first I thought there were two or three distinct forms; the type is undoubtedly an extreme aberration, and in this Museum there is one quite yellow with whitish hind-wings.

Genus Eurythecodes, Warr., Nov. Zool., iv, p. 117 (1897).
Trisyndeta, Warr., l. c., p. 260.

Eurythecodes flavedinaria.

Heterolocha flavedinaria, Guen., Phal., i, p. 106 (1857).
Heterolocha xanthiaria, Guen., l. c., pl. 11, f. 1.
Metanema molliaria, Guen., l. c., p. 172.
Trisyndeta subspersa, Warr., l. c.
Eurythecodes impunctata, Warr., l. c., v, p. 37 (1898).

1 ♂, Ndimu, mile 469, Uganda Railway. 1 ♀, mile 478, Uganda Railway. 1 ♂, Kikuyu.

Guenée's types came from Abyssinia, Warren's from Nandi and Uganda are in coll. Rothschild.

Genus Petrodava, Walker, xxvi, 1656 (1862).
Pseuderythra, Swinhoe, Trans. Ent. Soc., 1894, p. 204.

Petrodava albosignata.

Petrodava albosignata, Walker, xxvi, 1656.
„ „ Warr., Nov. Zool., ix, p. 529 (1902).

Petrodava olivata, var. *perfusca*, Warr., Nov. Zool., vi, p. 308.

1 ♂, without locality (type).

Warren's type, also a male from Kaligire, Unyoro, is in coll. Rothschild, and is identical with *albosignata*. I have it in my own collection from Bipindi in the Cameroons.

PETRODAVA LUCICOLOR.

Hypcrythra lucicolor, Butler, Ann. Mag. N. H. (4), xvi, p. 417 (1875).
Tycoonia natalensis, Warr., Nov. Zool., iv, p. 114, ♂ ♀ (1897).
Petrodava olivata, Warr., l. c., p. 253, ♂.
Petrodava latimargo, Warr., l. c., ix, p. 529, ♀ (1902).

1 ♂, Eb Urru, Brit. E. Africa. 2 ♀, Nairobi Forest, Kikuyu.

2 ♂, 1 ♀, Abyssinia.

Butler's types are from S. Africa in this Museum. Warren's types from Dar-es-Salaam and the Upper Congo are in coll Rothschild; they are all forms of one species, and even the following, which has a distinctive look, I describe and name with doubt.

PETRODAVA MARGINATA, nov.

♂, ♀. Yellow, irrorated with red atoms; palpi red, white at the end; head and abdomen diffused with orange-red; transverse bands on wings and cilia of that colour; no inner band visible, indications of a thin middle band, the discal band broad and continuous, its edges darkest; under-side darker and brighter than above, markings similar; a brown dot at the end of each cell.

Expanse of wings ♂ $1\frac{4}{16}$, ♀ $1\frac{1}{2}$ inches.

♂, ♀, Abyssinia (*Gerrard*).

PETRODAVA ILLITURATA.

Anthyperythra (?) *illiturata*, Warr., Nov. Zool., v, p. 255 (1897).

5 ♂, 2 ♀, Abyssinia.

The type, a male from S.E. Africa, is in coll. Rothschild.

Genus Osteodes, Guen., Phal., ii, p. 177 (1857).

Osteodes procidata.

Osteodes procidata, Guen., l. c.
Osteodes turbulentata, Guen., l. c.
Aspilates semispurcata, Walker, xxvi, 1679 (1862).
Aspilates exumbrata, Walker, xxvi, 1680.

1 ♂, Lagari, Brit. E. Africa. 1 ♂, Eb Urru, Brit. E. Africa. 1 ♂, 1 ♀, Munisu, Brit. E. Africa. 4 ♂, 4 ♀, Neugia, Brit. E. Africa.
The types are from South Africa.

Genus Luxiaria, Walker, xx, 231 (1860).

Luxiaria pudens, nov.

♀. White irrorated with grey; in markings resembling a *Lycauges* of the family *Sterrhidæ*; head and body covered with irrorations; fore-wings with the costa broadly grey; a grey oblique thick line from the centre of the hinder margin stopping before the apex; a brown submarginal band, formed of sinuous lines close together, broad on the hinder margin, attenuated upwards and ending in a point before the apex, forming a complete triangle, edged on each side with a dark line; the outer line angled on the veins; a similar line close to the margin and a marginal line; hind-wings with a medial thick line, a discal, broad, uniform band composed of three sinuous bands, and the two outer lines as on fore-wings; all the bands tinged with chocolate-colour; apex of fore-wings with a white patch: on the under-side there is an inner transverse (not oblique) thick line and two discal sinuous thick lines forming the outer band.
Expanse of wings $\frac{9}{10}$ inch.

Hab. Sapele, River Niger (*F. W. Sampson*).

Genus Semiothisa, Hübn., Verz., p. 298 (1818).

Macaria, Curt., Brit. Ent., vi, p. 132 (1823).

Semiothisa lataria.

Macaria lataria, Walker, xxiii, 921 (1861).

1 ♂, 1 ♀, Kibanni, Brit. E. Africa. 1 ♀, Onitsha, River Niger.
Walker's type, a male, is from Natal.

Semiothisa amandata.

Macaria amandata, Walker, xxiii, 922 (1861).
Macaria angolaria, Snell., Tijd. v. Ent. (2), vii, p. 81, pl. 6, f. 12, 13 (1872).

1 ♀, Congo (type). 1 ♂, Rusisi Valley, 3500 feet (*E. L. Grogan*). 1 ♀, Yelwa Lake, Borgu, N.W. Nigeria.

Snellen's figure of his type, a male from Lower Guinea, in coll. Snellen, closely resembles Walker's type from the Congo, both upper and under-side.

Semiothisa siennata.

Gonodela siennata, Warr., Nov. Zool., vii, p. 95 (1900).

1 ♂, Old Calabar. 1 ♀, Pt. Lokko, Sierra Leone.

The type, a male from Warri, is in coll. Rothschild.

Semiothisa dentilineata.

Tephrina dentilineata, Warr., Nov. Zool., vi, p. 309 (1899).

1 ♀, Abyssinia.

The type, a male from Masindi, is in coll. Rothschild.

Semiothisa sherrata, nov.

♂. Hind-wings shaped as in the *Gonodela* section of this genus, the pattern of the wings is however more in the resemblance of a *Gubaria*: head, body, and wings greyish-chocolate colour, collar-ring white; fore-wings with a white apical patch and a white spot near hinder angle; both wings with a broad white middle band, edged inwardly with darker chocolate-colour, the space inside the band pale and striated with chocolate, the outer edge of the band bordered by a darker sinuous line rounded inwards to the costa, and the band somewhat contracted towards the abdominal margin of the hind-wings; on the outer side of the band there are some brown marks on the fore-wings and on the hind-wings two medial square patches with white outer edges; the outer border pale with striations and the marginal line brown; on the under-side the body and legs and basal third of wings are yellow, followed by a chocolate band, a broad middle band, and a chocolate discal band; the outer margin more or less paler greyish-chocolate, leaving the apex of fore-wings and most of the hind-wings white, all the white both above and below more or less striated with chocolate-grey.

Expanse of wings $1\frac{3}{10}$ inches.

Hab. Congo (*Marsden*).

Semiothisa largificaria.

Semiothisa largificaria, Mösch., Abh. Senck. Nat. Ges., xv, p. 95, f. 20 (1889).

1 ♂, 1 ♀, Zomba.
Möschler's type came from Accra.

Semiothisa impar.

Gonodela impar, Warr., Nov. Zool., iv, p. 107 (1897).

2 ♂, Ashanti. 2 ♂, Pt. Lokko, Sierra Leone. 1 ♂, 1 ♀, Aburi, Gold Coast. 1 ♀, Opobo.
The types, ♂ ♀ from Warri, Niger C. P., are in coll. Rothschild.

Semiothisa kilimanjarensis.

Gonodela kilimanjarensis, Holland, Ent., xxv (Suppl.), p. 95 (1892).
Gonodela zombina, Butler, P. Z. S., 1893, p. 683.

3 ♂, 1 ♀, Zomba, including the type of *zombina*. 1 ♂, 1 ♀, Nyassaland. 1 ♂, Tanganyika. 1 ♀, Chinde to Mandala, Brit. Central Africa.
The type from Kilimanjaro is in coll. Holland, the description fits *zombina* very well.

Semiothisa unifilata.

Gonodela unifilata, Warr., Nov. Zool., vi, p. 307 (1899).

2 ♂, Abyssinia.
The type, a male from Unyoro, is in coll. Rothschild.

Semiothisa crassilembaria.

Macaria crassilembaria, Mab., C. R. S. E. Belg., xxiii, p. 23 (1880).
Azata costiguttata, Warr., Nov. Zool., vi, p. 58 (1899).
Azata triplaga, Warr., l. c., p. 59.

1 ♂, Quaso, Brit. E. Africa. 1 ♀, Madagascar (*Mus. Paris*).
Mabile's type is from Madagascar; Warren's types, both females, are from Mikindani, German E. Africa, both marked Jan.—May 1897 (Reimer), and appear to me to be absolutely identical with our Madagascar example.

Semiothisa trirecurvata.

Macaria trirecurvata, Saalm., Lep. Madag., p. 497, pl. 14, f. 263 (1884).

Semiothisa confuscata, Warr., Nov. Zool., vi, p. 308 (1899).

1 ♀, Yelwa Lake, Borgu, N. W. Nigeria. 1 ♀, Madagascar (*Mus. Paris*).

The type of *confuscata*, a male from Warringo, Unyoro, is in coll. Rothschild.

Semiothisa conturbata.

Gonodela conturbata, Warr., Nov. Zool., v, p. 251 (1898).

1 ♀, Accra. 2 ♂, Old Calabar.

The type, a female from Warri, is in coll. Rothschild.

Semiothisa cararia, nov.

♂. Pale ochreous-grey, irrorated with brown atoms; bands purplish-brown; fore-wings with inner, medial, and discal thin bands, all more or less sinuous and all curving in abruptly on to the costa of fore-wings; the two outer bands are continued on the hind-wings, the outer band on the latter curving outwards in the form of the outer margin; on both wings the space outside the outer band is more or less suffused with purplish-brown, and there are two branches on the fore-wings connecting the band with the outer margin; the under-side is pure white irrorated with brown, with the bands prominent.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. Muani, Brit. East Africa (*C. S. Betton*).

Semiothisa maculosa.

Gonodela maculosa, Warr., Nov. Zool., vi, p. 306 (1899).

2 ♀, Abyssinia. 1 ♀, Kilimanjaro. 2 ♂, Mazingo, Brit. E. Africa. 1 ♂, Ahoos, Brit. E. Africa. 1 ♂, Aiwea, Brit. E. Africa. 1 ♂ Katesa, Uganda.

The type, a male from Fovira, Unyoro, is in coll. Rothschild.

Semiothisa obliquilineata.

Gonodela obliquilineata, Warr., Nov. Zool., vi, p. 307 (1899).

1 ♂, 1 ♀, Kibauni Machakos to Neugia. 1 ♀, Abyssinia. 1 ♀, Muani, Brit. E. Africa.

The types from Muani are in coll. Rothschild.

Semiothisa tattaria, nov.

♂. Ochreous-grey thickly irrorated and striated with chocolate-brown; bands and markings of that colour; fore-wings with a thin band before the middle curving inwards close to and on to the costa; both wings with a similar medial band, running through the brown lunule at the end of the cell of the fore-wings and inside the cell spot of hind-wings; a broad paler band across the disc of both wings, broken towards costa of fore-wings, where there is a blunt angular patch before the apex; this patch is lined with dark brown, as is also the inner side of the band; the remainder of both wings is more or less shaded with brown, and through this shading on the hind-wings runs a whitish band, and there are present on both wings some small brown patches; outer margin with brown lunules; under-side whitish with the bands paler.

Expanse of wings 1 inch.

Hab. Kirbehs, Nov. 6, Brit. E. Africa (*Betton*).

Allied to *S. maculosa*, Warr.

Semiothisa instructaria, nov.

♀. Ochreous-grey irrorated with chocolate-brown; a brown dot at the end of each cell; indications of a sinuous interior line on fore-wings and of a medial line on both wings, fairly well indicated in one example; a sinuous discal line from hinder margin to outer margin below apex, inwardly curved, with some dark brown spots outside it, and limiting a dark brown marginal space; marginal lunules dark brown: under-side rather bright ochreous-yellow, with cell dots, a discal brown band, and some slight brownish suffusion beyond it in parts: one example which I make the type is yellower and paler than the other.

Expanse of wings 1 inch.

1 ♀, Kilimanjaro (type) (*F. G. Jackson*). 1 ♀, Teita, Brit. E. Africa.

Semiothisa rectistriaria.

Acadra rectistriaria, Herr.-Schäff., Ausser. Schm., f. 197 (1854).
Macaria streniata, Guen., Phal., ii, p. 87 (1857).
Macaria monstraria, Walker, xxiii, 940 (1861).
Macaria postvittata, Walker, xxvi, 1646 (1862).

1 ♂, Sierra Leone (type *postvittata*). 1 ♂, without locality (type *monstraria*). 1 ♂, Fort Smith, Kikuyu, Brit. E. Africa. 1 ♂, Forest of Tiveta.

Herrich-Schäffer's type came from South Africa, and Guenée's from Abyssinia.

Semiothisa rhabdophora.

Gonodela rhabdophora, Holland, Entom., xxv (Suppl.), p. 95 (1892).
Tephrina johnstoni, Butler, P. Z. S., 1893, p. 683.

2 ♂, Zomba, including the type of *johnstoni*.
The type of *rhabdophora* is in coll. Holland.

Semiothisa majestica.

Semiothisa majestica, Warr., Nov. Zool., viii, p. 213 (1901).

1 ♂, E. Africa.
Warren's type, a male from Angola, is in coll. Rothschild.

Semiothisa uvidaria, nov.

♀. Dull ochreous irrorated and striated with brown atoms; a brown mark at the end of each cell; a small brown patch on the middle of the costa of fore-wings, from which an irregular and sinuous brown line runs down through the cell spots and across both wings to the middle of the abdominal margin; a broad purple-brown discal band across both wings, limited inwardly by a darker line which curves inward on to the costa of fore-wings, leaving a small yellow spot on the costa; below the apex the band has a short branch as broad as itself running on to the outer margin, leaving a large yellow apical spot; on the hind-wing at the apex the band thickens outwards on to the outer margin; under-side pure pale yellow with the bands and lines well defined.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. Tonga, Brit. E. Africa (*Hollis*).

Semiothisa arhoparia, nov.

♂. Pale ochreous chocolate-brown; lines and bands darker brown; fore-wings with an interior sinuous line curved inwards on to costa and hinder margin; both wings with a medial nearly straight band; a discal line angled on fore-wings before reaching costa towards which it is bent inwards; this line is outwardly edged with yellowish, and the outer part of the wings more or less suffused; some brown spots across the hind-wing just inside the line: under-side pale ochreous with medial and discal brownish bands.

Expanse of wings $1\frac{4}{10}$ inches.

Hab. Tana River, Brit. E. Africa (*Crawshay*).

Belongs to Warren's section, *Peridela*, Nov. Zool., iv, p. 110; the antennæ of the male being pectinated instead of simply pubescent.

Semiothisa butaria, nov.

♂. Whitish, almost bone-colour, with a slight tinge of ochreous, sparsely striated with brown, the bands and markings pale brown; fore-wings with some thicker striations along the costa; indications of an inner band on one female; both wings with a medial nearly straight band, rather dislocated on the fore-wings, thin and indistinct on the hind-wings; a blunt angulated mark on costa of fore-wings before the apex, and a broad band from outer margin below the apex to the hinder margin near the angle; on the hind-wings this band is purely discal, thin and only faintly indicated; marginal lunules brown; under-side like the upper-side, the bands more indistinct.

Expanse of wings $1\frac{2}{16}$ inches.

1 ♂, Kilimanjaro (type) (*F. J. Jackson*). 1 ♂, Machakos to Neugia (*Crawshay*). 1 ♂, Central Africa (*Emin*).

This also belong to the Section *Peridela*.

Semiothisa contaminata.

Gubaria contaminata, Warr., Nov. Zool., ix, p. 528 (1902).

1 ♀, Kikuyu, Neugia. 1 ♂, Tiveta Forest.

Warren's types, male and female, from the Escarpment, Brit. E. Africa, are in coll. Rothschild.

Semiothisa fulvisparsa.

Acadra fulvisparsa, Warr., Nov. Zool., iv, p. 104 (1897).

1 ♂, 1 ♀, Asaba, W. Africa.

The type, a female from Warri, is in coll. Rothschild.

Genus Tephrina, Dup., Cat. Lep. Eur., p. 246 (1844).

Tephrina deerraria.

Tephrina deerraria, Walker, xxiii, 962 (1861).
Aspilates occupata, Walker, xxiv, 1071 (1862).
Aspilates spissata, Walker, xxiv, 1071.
Tephrina deerraria (?) ab. *dissocia*, Warr., Nov. Zool., iv, p. 112 (1897).

1 ♂, Abyssinia. 1 ♀, N'Gami Country. 2 ♂, Machakos, Brit. E. Africa.

The types in the B. M., and in coll. Rothschild are from S. Africa.

TEPHRINA DISPUTARIA.

Eubolia (?) *disputaria*, Guen., Phal., ii, p. 489 (1857).
Diastictis disputaria, Swinhoe, Cat. Het. Mus. Oxon., ii, p. 272 (1900).

1 ♂, 1 ♀, Kirbehs, Brit. E. Africa.

Guenée's type of this very widely-spread moth came from Egypt; it is in the Museum from many parts of India, and from Aden, and has many names.

TEPHRINA CATALAUNARIA.

Psamatodes catalaunaria, Guen., Phal., ii, p. 108 (1857).
Macaria falsaria, Walker, xxvi, 1649 (1862).
Panagra (?) *cogitata*, Walker, xxvi, 1661.
Aspilates proxantharia, Walker, xxvi, 1679.
Macaria bolina, Swinhoe, P. Z. S., 1885, p. 861.

2 ♂, Abyssinia. 2 ♂, 3 ♀, Yelwa Lake, Borgu, N. W. Nigeria. 1 ♂, Ngare Rougai Swamp, Brit. E. Africa. 1 ♂, Neugia. 1 ♂, Eb Urru. 1 ♂, Kilimanjaro. 1 ♂, 1 ♀, Nyassaland.

Guenée's type came from Catalonia; Walker's type of *falsaria* from Ceylon, of *cogitata* and *proxantharia* from S. Africa, and the types of *bolina* from Poona are all in this Museum.

TEPHRINA CINERASCENS.

Acidalia cinerascens, Butler, Ann. Mag. N. H. (4), xvi, p. 418 (1875).
Tephrina antennata, Warr., Nov. Zool., iv, p. 399 (1897).

1 ♂, Machakos.

The type, a female, is from S. Africa. Warren's type, a male from Rustenburg, is in coll. Rothschild; Warren also records it from Dar-es-Salaam.

TEPHRINA PRESBITARIA, nov.

♂. Pale bone-colour, faintly tinged with ochreous, sparsely irrorated with brown; bands and marks pale brown; fore-wings with the inner band indicated by two or three spots; both wings

with a thin, straight middle band, a broader discal band, and the outer portion beyond this of a slightly paler brown colour; marginal line brown, more or less lunular; under-side same as upper-side but paler.

Expanse of wings $1\frac{4}{10}$ inches.

Hab. Athi Valley, 4000 feet, Brit. E. Africa (*Crawshay*).

Tephrina exospilata.

Panagra exospilata, Walker, xxiii, 987 (1861).
Tephrina ansorgei, Warr., Nov. Zool., v, p. 253 (1898).

Walker's type is in the B. M. from S. Africa.

The type of *ansorgei*, a ♂ from Uganda, is in coll. Rothschild.

Tephrina brongusaria.

Epione (?) *brongusaria*, Walker, xx, 123 (1860).
Tephrina incessaria, Walker, xxiii, 962 (1862).

1 ♂, Rusisi, 3500 feet, Brit. E. Africa. The types in the B. M. are from S. Africa.

This and the following belong to Warren's Section *Tephrinopsis*, Nov. Zool., iii, p. 412, having males with simple antennæ, not pectinated as in typical *Tephrina*.

Tephrina parallelaria.

Aspilates parallelaria, Walker, xxvi, 1680 (1862).
Aspilates (?) *exfusaria*, Walker, xxvi, 1683.
Tephrina desiccata, Walker, xxxv, 1660 (1866).
Tephrinopsis congener, Warr., Nov. Zool., iv, p. 113 (1897).

1 ♂, 2 ♀, Borgu, N. W. Nigeria. 3 ♂, Madagascar.

The types of *parallelaria* from Ceylon, *exfusaria*, Moreton Bay, *desiccata*, Java, with many examples from India and S. Africa, are in the B. M.; Warren's type from the Philippines is in coll. Rothschild; a widely distributed species; very uniform in shape, pattern, and colour.

Tephrina observata.

Tephrina observata, Walker, xxiii, 963 (1861).

1 ♂, Abyssinia.

The type is from S. Africa.

TEPHRINA SEMICOLOR.

Tephrinopsis semicolor, Warr., Nov. Zool., vi, p. 311 (1899).

1 ♂, Kikuyu, Neugia (*B. C. Crawshay*).

The types, male and female, from Mau, Uganda, are in coll. Rothschild.

TEPHRINA MARMORATA.

Tephrinopsis marmorata, Warr., Nov. Zool., iv, p. 114 (1897).

Tephrinopsis marmorata, ab. *pallida*, Warr., l. c.

1 ♂, 1 ♀, Gwelil, Brit. E. Africa.

The types from S. Africa are in coll. Rothschild. This species has stood in collections as an aberration of *brongusaria*, but this cannot be possible, the male having serrated antennæ with the teeth distinct and strong; it will form a fresh Section to the Genus, along with the following.

TEPHRINA OLINDARIA, nov.

♂. Pale ochreous-grey, irrorated with brown; bands and markings brown; fore-wing with a small black lunule at end of cell; antemedial and medial erect thin bands rather close together, the former bent inwards close to and on to the costa; an angular mark on the costa before apex; a thick band from the outer margin below the apex to the hinder margin near the angle, the band gradually curving inwards and suffused outwards; the hind-wings are white, and paler in colour; there is a minute black dot at the end of the cell, and indications in some examples of a thin medial band; the discal band narrow only on the abdominal half of the wing; marginal lunules brown, cilia ochreous, brownish towards apex of fore-wings; under-side ochreous with hardly any markings.

Expanse of wings 1½ inches.

5 ♂, 1 ♀, Machakos (*Crawshay*).

Genus CŒNINA, Walker, xx, 217 (1860).

CŒNINA DENTATARIA, nov.

♀. Ochreous-grey, fore-wings irrorated with dark grey, bands and markings brown; two very oblique thin bands, ante- and post-medial, the first acutely angled outwards below the costa, the other well curved outwardly, its hinder end curving inwards on to the hinder margin close to the origin of the first band; some thick suffusion on the costa near the base, two small hyaline patches below the middle, with

a dot below each, a small sub-apical spot; marginal line brown, cilia with brown patches; hind-wings tinged with red; some fine grey striations; a small hyaline patch in the middle of the wing with a hyaline spot on its inner side; under-side same as above, markings more distinct.

Expanse of wings $1\frac{6}{10}$ inches.

1 ♀, Abyssinia (*Gerrard*).

Cœnina aurivena.

Cœnina aurivena, Butler, P. Z. S., 1898, p. 129.
Cœnina cervina, Warr., Nov. Zool., vi, p. 63 (1899).

2 ♂, 2 ♀, Accra. 1 ♀, Samburu, Brit. E. Africa (type). 1 ♂, Machakos, Brit. E. Africa (type). 1 ♀, Pt. Lokko, Sierra Leone.

Warren's type, a male from the Congo, is in coll. Rothschild; this was reported in Zoological Record by mistake as from Abyssinia; the Abyssinian examples referred to by Warren, apparently from memory, are quite distinct from this form.

Genus Xenimpia, Warr., Nov. Zool., ii, p. 135 (1895).

Xenimpia erosa.

Xenimpia erosa, Warr., l. c.

1 ♀, Accra. The type, a female from the Congo, is in coll. Rothschild.

Genus Procypha, Warr., Nov. Zool., iv, p. 121 (1897), and ix, p. 532 (1902).

Triprora, Warr., l. c., iv, p. 401.
Hexeris, Saalm., Lep. Madag., p. 498 (1884) (præocc).

Procypha sillaria, nov.

♂. Antennæ, palpi, frons, head, fore-part of the thorax and the fore-wings blackish-brown; fore-wings with a blackish line from the costa along the discoidal veinlet, then straight down to the hinder margin two-thirds from the base; the straight part of this line is the inner limit of a large reddish-ochreous patch at the angle, which contains a white lunular submarginal line, which runs up the wing and on its inner side has a reddish-ochreous streak which runs up from the patch; remainder of thorax, the abdomen, and the hind-wings reddish-ochreous; the hind-wings are streaked with pale red-brown,

and there is a thin band of that colour across the disc of the wing; under-side much as above, but the reddish-ochreous portions are nearly white.

Expanse of wings $1\frac{1}{10}$ inches.

Accra (*Carter*).

PROCYPHA INFORMIS, nov.

♂. Antennæ black, longer and more heavily pectinated than is usual in this genus. Palpi, head, body, and wings brown; fore-wings with two indistinct blackish transverse lines, very oblique, ante- and post-medial, closer together on the hinder margin than on the costa, where they are acutely bent inwards, and marked with two black spots; also a discal row of black dots; hind-wings rather darker than the fore-wings and with a red tinge; indications of a central line and a blackish spot at the end of the cell; under-side with the ground-colour whitish, the wings irrorated with brown, markings as above but much more pronounced.

Expanse of wings $1\frac{2}{10}$ inches.

Old Calabar (*Miss Kingsley*).

Genus ZAMARADA, Moore, Lep. Ceylon, iii, p. 432 (1887).

ZAMARADA FLAVICOSTA.

Zamarada flavicosta, Warr., Nov. Zool., iv, p. 122 (1897).

1 ♂, 2 ♀, Sapele, River Niger. 1 ♂, Old Calabar. 1 ♀, Freetown, Sierra Leone.

The types, male and female from Warri, are in coll. Rothschild.

ZAMARADA NASUTA.

Zamarada nasuta, Warr., Nov. Zool., iv, p. 122 (1897).

1 ♂, Matope, Nyassaland. 1 ♂, 1 ♀, Old Calabar. 1 ♂, Sierra Leone. 1 ♀, Gold Coast.

The type, a female from Lokoja, River Niger, is in coll. Rothschild.

ZAMARADA PROTRUSA.

Zamarada protrusa, Warr., Nov. Zool., iv, p. 123 (1897).

1 ♂, Aburi. 1 ♀, Lagos.

The type a female from Akassa, River Niger, is in coll. Rothschild.

ZAMARADA VULPINA.

Zamarada vulpina, Warr., Nov. Zool., iv, p. 123 (1897).

1 ♂, Abutshi, S. Nigeria. 1 ♀, Sapele, River Niger. 1 ♀, Aburi, Gold Coast.

The type a male from Warri, River Niger, is in coll. Rothschild.

ZAMARADA ILARIA, nov.

♂. Antennæ black, frons pale pinkish, palpi, head, and thorax in front dark brown-pink, rest of thorax and abdomen pale brown-pink; wings hyaline with a green tint, and with the borders and markings pale brown-pink; fore-wings with a large round spot at the end of the cell, a costal line, rather thick, and broad outer marginal borders to both wings, both excavated in a square form a little below the middle; these borders are limited interiorly by a brown line, have brown spear-shaped spots with pale borders just inside them, and the cilia are deep, of a purer colour than the border, marked with rather large dark-brown spots; on the under-side the borders are very indistinctly seen, but there is a large square white apical patch on the fore-wings with a larger black square patch attached.

Expanse of wings 1 inch.

Hab. SIERRA LEONE (*W. G. Clements*).

ZAMARADA PULVEROSA.

Zamarada pulverosa, Warr., Nov. Zool., ii, p. 158 (1895).

2 ♂, 2 ♀, Machakos, Brit. E. Africa. 1 ♀, Tana River.

These specimens are much larger than the type form from South Africa in coll. Rothschild and the numerous examples in this Museum, but there is no other difference: there is a typical example in this Museum from Northern Etbari, Upper Egypt.

ZAMARADA RUFILINEARIA, nov.

♂ ♀. Antennæ, palpi, head, body and outer borders of the wings black, the rest of the wings hyaline with a greenish-ochreous tint; both borders limited interiorly by a sinuous darker line, slightly excavated on both wings below the middle; a bright crimson sinuous line, dentated in parts, right through the centre of both bands, and a thick orange line or band on the costa of fore-wings, black at the

base ; the under-side is like the upper-side, but the crimson line is absent ; body and legs pale ochreous-grey.

Expanse of wings ♂ $\frac{9}{10}$, ♀ 1 inch.

Hab. Dar-es-Salaam, German East Africa (*Fruhstorfer*).

Zamarada ixiaria, nov.

♀. Antennæ, palpi, head, body, and outer marginal band of the wings dark chocolate-brown, rest of the wings hyaline with a green tint, the hyaline part finely striated with pale ochreous-grey ; fore-wings with a pale grey lunule at the end of the cell, and a pale chocolate-brown costal line ; the outer borders limited inwardly by a sinuous blackish line, straight across on the fore-wings, curved like the outer margin on the hind-wings, with a round but not deep excavation below the middle ; both borders have a blackish-brown sinuous thin band running right through them, a little closer to the inner margin than to the outer ; under-side same as upper-side ; body and legs whitish.

Expanse of wings $1\frac{3}{10}$ inches.

Hab. Port Lokko, Sierra Leone (*Penny*).

Allied to *Z. reflexaria*, Walker, but that species has the band on both wings deeply excavated.

Zamarada reflexaria.

Comibæna reflexaria, Walker, xxvi, 1565 (1862).
Euchloris exarata, Felder, Reise Nov., pl. 127, f. 8 (1874).
Zamarada latimargo, Warr., Nov. Zool., iv, p. 261 (1897).

1 ♂, Sierra Leone (type). 1 ♀, without locality. 1 ♂, Old Calabar. 1 ♂, 1 ♀, Sapele, River Niger.

Warren's type, a male from Upoto, Congo, is in coll. Rothschild and so also is Felder's type from Knysna.

Zamarada phrontisaria, nov.

♂, ♀. Antennæ blackish-brown, palpi, frons, and body pinkish-grey ; the thorax with a dull greenish tinge ; wings semi-hyaline, the hyaline part evenly and thickly striated with very fine ochreous striations ; costal band of fore-wings, a spot at the end of each cell, and the broad outer borders to both wings pale purplish-grey, lined both on the outer margin and on the inner border with dark brown, the latter being sinuous and roundly and deeply excavated a little below the middle on both wings ; the outer border is mottled with white, and has a grey sinuous thin band running through the middle

of it; under-side like the upper-side but the mottlings and inner-band of the outer borders absent; body and legs whitish.

Expanse of wings $\frac{3}{10}$ inch.

1 ♂, 1 ♀, Old Calabar (types) (*Crompton*). 1 ♂, Sapele, River Niger (*Sampson*).

ZAMARADA PERLEPIDATA.

Comibæna perlepidata, Walker, xxvi, 1565 (1862).

1 ♂, Sierra Leone (type). 1 ♀, Ogbomoso, Yorubaland.

Genus PSEUDOCROCINIS, nov.

Antennæ bipectinated; palpi upturned, fairly well clothed, last joint minute; hind tibiæ dilated and with two pairs of spurs, tarsi aborted, very short; fore-wings with the costa arched, apex produced and blunt at the tip, outer margin oblique; hind-wings with the outer margin round; fore-wings with vein 3 from before end of cell, 4 from the end, 6 from upper end, 7, 8, 9, 10 and 11 stalked, 11 connected with 12; hind-wings with 3 and 4 from end of cell, 6 from upper end, 7 from before the end.

Type *plana*, Butler.

PSEUDOCROCINIS PLANA.

Crocinis plana, Butler, Ann. Mag. N. H. (5), iv, p. 245 (1879).

1 ♂, 1 ♀, Madagascar (types).

PSEUDOCROCINIS OCHRACEA.

Crocinis ochracea, Butler, Ann. Mag. N. H. (5), iv, p. 245 (1879).

1 ♂, Madagascar (type).

The type of the genus *Crocinis* is a *Drepanulid*. This species differs somewhat in structure from *plana*, vein 11 in fore-wings being from the cell instead of stalked, and 9 apparently absent.

Genus GEOLYCES, Warr., Nov. Zool., i, p. 441 (1894).

Lyces, Walker, xx, 248 (1860) (præocc.).
Autophylla, Warr., l. c., p. 451.
Miantochora, Warr., l. c., ii, p. 145 (1895); and iii, p. 401 (1896).

GEOLYCES ATTESARIA.

Lyces attesaria, Walker, xx, 249, ♂.
Geolyces attesaria, Warr., l. c., i, p. 441.
Autophylla pallida, Warr., l. c., p. 451, ♀.

1 ♂, Congo (type).

Warren's type is in coll. Rothschild; it was at first supposed to have come from South America, but the locality label on it was incorrect, many examples having since been received at Tring from South Africa.

The sexes differ considerably in outline.

GEOLYCES INÆQUILINEA.

Miantochora inæquilinea, Warr., Nov. Zool., ii, p. 145 (1895); and iv, p. 401, note (1897).
Miantochora incolorata, Warr., l. c., iv, p. 64.

2 ♂, Sierra Leone.

The types, both males, are in coll. Rothschild; *inæquilinea* was first said to have come from S. America and afterwards from S. Africa; *incolorata* is from Warri, Niger Coast Protectorate.

GEOLYCES RUFARIA, nov.

♂. Antennæ brown, palpi brown above, ochreous beneath and at the tips, frons ochreous, head, body, and wings of a uniform ochreous-red colour; the ground-colour is really ochreous, but the body and wings are much striated and irrorated with red-brown; there are indications of a central thin grey band across both wings, also of an outer band, much as in *inæquilinea*, Warr.; the under-side is pale dull ochreous, very uniform in colour, with a few grey striations and indications of the outer band of the fore-wings.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. OLD CALABAR (*Miss Kingsley*).

Genus PSILOCEREA, Saalm., Bericht. Senck. Ges., 1880, p. 292.

Eupsamma, Warr., Nov. Zool., i, p. 461 (1894).
Acanthoscelis, Warr., l. c., viii, p. 215 (1901) (præocc.).
Xanthisthisa, Speiser, Berl. Ent. Zeit., xlvii, p. 140 (1903).

Psilocerea modesta.

Marcala (?) *modesta*, Butler, Ann. Mag. N. H. (5), v, p. 390 (1880).

Gynopteryx sipariata, Saalm., Madag., p. 494, f. 277 ♂ (1884).

2 ♂, 1 ♀, Madagascar, including the type.

Psilocerea piperata.

Crocinis piperata, Saalm., Bericht. Senck. Ges., 1880, p. 294 ♀.

Gynopteryx piperata, Saalm., Madag., p. 494 (1884).

1 ♀, Madagascar.

Psilocerea tumida.

Psilocerea tumida, Warr., Nov. Zool., ix, p. 534 (1902).

2 ♀, mile 478, Uganda Railway, Brit. East Africa.

Warren's type, a female from the Escarpment, is in coll. Rothschild.

Psilocerea vestitaria, nov.

♀. Grey with a slight pinkish tinge, uniform in coloration, irrorated with blackish-brown; a black dot at the end of each cell; a pale ochreous-brown indistinct interior band on the fore-wings, outwardly curved; a straight double line of the same colour from the apex of the fore-wings (where there is some brown suffusion) to the abdominal margin of hind-wings, a little below the middle, and two black spots on the hind-wings below this double line a little below the middle; outer margin of both wings slightly suffused with pale ochreous-brown; under-side slightly paler than the upper-side, well irrorated, the markings almost obsolete.

Expanse of wings $1\frac{9}{10}$ inches.

Hab. Madagascar (*Cowan*).

Psilocerea rachicera.

Panagra rachicera, Butler, Ann. Mag. N. H. (5), v, p. 391 (1880).

3 ♂, 1 ♀, Madagascar, including the type.

Psilocerea umbrosaria, nov.

♀. Uniform pinkish-grey, with slight ochreous tint, covered with greyish-brown striations; a black dot at the end of each cell; a brown

line edged outwardly with whitish, across the disc of fore-wings, inwardly curved, almost straight on the hind-wings where it is nearly medial; an indistinct outwardly curved grey inner band on the fore-wings; a broad space inside the discal line suffused with brownish, and also some suffusion of the same colour near the apex and outside the discal line; under-side much paler with the outer line distinct.

Expanse of wings $1\frac{5}{16}$ inches.

Hab. Mile 478, Uganda Railway (*Betton*).

PSILOCEREA ANEARIA, nov.

♂. Pale brown with an ochreous tinge; plumes of antennæ brown, shaft ochreous with brown spots; frons and head ochreous, body and wings uniformly coloured, sparsely irrorated with blackish-brown atoms; a black dot at the end of each cell; indications of a black interior line on fore-wings outwardly curved, most distinct below the costa; a pale grey line, outwardly edged with whitish, quite straight but very indistinct, picked out with white specks with black points, running from the apex, near which is a black spot on the costa, to the middle of the hinder margin; hind-wings with a medial thin band, blackish and not very distinct, with some blackish marks below it and two black spots close together in the disc below the middle; under-side pinkish-white with the markings plainly shown and mostly black.

Expanse of wings $1\frac{7}{16}$ inches.

Hab. MADAGASCAR (*Cowan*).

PSILOCEREA DYSONARIA, nov.

♀. Pale uniform grey with a pinkish tinge irrorated with chestnut-brown atoms; the markings also chestnut-brown; a double straight band from apex of fore-wings, where there is a dark suffused space, to the middle of the abdominal margin of hind-wings, the interior space of the double band is whitish and there is a whitish edging on the outer side of it; on the outer margin of both wings there is some red-brown suffusion; under-side as above but paler.

Expanse of wings $1\frac{7}{16}$ inches.

Hab. MADAGASCAR (*Cowan*).

PSILOCEREA NIGROMACULATA.

Psilocerea nigromaculata, Warr., Nov. Zool., iv, p. 98 (1897).

1 ♂, Madagascar.

The type, a male from Madagascar, is in coll. Rothschild.

Psilocerea tarsispina.

Acanthoscelis tarsispina, Warr., Nov. Zool., viii, p. 215 (1901).

4 ♂, 1 ♀, mile 478, Uganda Railway. 1 ♀, E. Quaso, Masai.

The type, a male, from Second Kedong, Brit. East Africa, is in coll. Rothschild.

Genus Milocera, nov.

Antennæ of male finely ciliated; palpi porrect, fairly well clothed, short and blunt, third joint minute, almost hidden; hind tarsi with two pairs of short spurs; fore-wings with the costa well arched, apex produced and somewhat falcate, outer margin concave below apex; hind-wings rounded; fore-wings with vein 3 from before end, 4 from end of cell, 6 from upper end, 7, 8, 9 and 10 stalked, 11 free; a small fovea crossing vein 1; hind-wings with vein 3 before end, 4 from end of cell, 6 and 7 from upper end.

Type *horaria*, nov.

Allied to *Psilocladia*, Warr., Nov. Zool., v, p. 40.

Milocera horaria, nov.

♂. Whitish suffused in parts with ochreous-brown, irrorated and striated with brown; in one example the whole of the fore-wings is suffused with brown, but in the type specimen only the apical half of the wings is suffused, the rest and the whole of the hind-wings whitish; interior line crossing fore-wings brown and bluntly dentated; a brown line from apex of fore-wings to middle of abdominal margin of hind-wings, slightly sinuous; a large brown patch, round on fore-wings and below the middle of the line, on the hind-wings rather a dark suffusion; a streak below the line from the abdominal margin; a black dot at the end of the cell on all the wings; under-side white with the markings dark and distinct.

Expanse of wings $\frac{9}{10}$ inch.

2 ♂, Madagascar (*Cowan*).

Genus Hypochrosis, Guen., Phal., ii, p. 536 (1857).

Hypochrosis ætionaria, nov.

♂. Pinkish-red; fore-wings with indications of an interior transverse erect line, a prominent medial erect dark red line, edged

inwardly with whitish, and indications of a line from hinder margin, near the angle to near the apex and then abruptly angled and bent inwards on to the costa near the apex; costal line and cilia dark red; hind-wings pale red tinged with grey and unmarked; under-side of a uniform pale pinkish-red colour; some brown marks on costa of fore-wings and a spot at end of cell of hind-wings.

Expanse of wings $1\frac{4}{10}$ inches.

MADAGASCAR (*Cowan*).

Genus HÆMATORITHRA, Butler, Ann. Mag. N. H. (6), xviii, p. 106 (1896).

HÆMATORITHRA RUBRIFASCIATA.

Hæmatorithra rubrifasciata, Butler, l. c.

2 ♂, Nyassaland, including the type. 1 ♀, Mgana, Brit. E. Africa.

Genus ENCOMA, nov.

♀. Antennæ bipectinate; fore-wings with vein 5 from nearly the upper end of the discocellular, 5 and 6 so close together as to appear to be shortly stalked, 7 absent, 8, 9 and 10 stalked, 11 from the cell.

Type *irisaria*, nov.

ENCOMA IRISARIA, nov.

♂. Ochreous-white; upper-side of palpi and branches of antennæ brown; fore-wings slightly darker and more yellow than the hind-wings; both wings with a brown middle straight band, a discal waved band of brown spots, a blackish waved submarginal band, and black marginal dots; a black dot at the end of each cell, and a black dot on the hinder margin of fore-wings one-fourth from the base, with another above it; under-side same as above.

Expanse of wings $\frac{8}{10}$ inch.

2 ♀, mile 478, Uganda Railway (*Betton*).

Genus DICHROMA, Duncan, Exotic Moths, Nat. Libr., xxvii, p. 224 (1841).

Argyrophora, Guen., Phal., ii, p. 230 (1857).

DICHROMA TROFONIA.

Phalæna-geometra trofonia, Cram., Pap. Exot., iii, p. 92, pl. 247, f. F (1782).
Dichroma histrionalis, Duncan, l. c., p. 227, pl. 30, f. 2.
Dichroma arcualis, Duncan, l. c., p. 228, pl. 30, f. 3.
Argyrophora monetata, Guen., l. c.

1 ♂, Madagascar.

The generic name seems to have been suggested by Westwood and described by Duncan.

Genus Coptopteryx, Holland, Ent. News, 1893, p. 174.

Coptopteryx brunnea.

Azelinopsis brunnea, Warr., l. c., iv, p. 115, ♂ (1897).
Neuropolodes fulvata, Warr., l. c., viii, p. 19, ♀ (1901).

1 ♂, Pt. Lokko, Sierra Leone. 1 ♂, Asaba, W. Africa.

The types, a male from Asaba and female from Sierra Leone, are in coll. Rothschild; the hyaline lunule at the end of the cell is of a very peculiarly twisted nature in the hind-wings, and this is represented in both sexes, together with all the colour markings, but the female has no hyaline lunules visible on the fore-wings.

Coptopteryx homochroa.

Coptopteryx homochroa, Holland, Ent. News, 1893, p. 175, pl. 9, f. 19.

1 ♂, Ogove River (*Holland*).

The type, a male, is also from the same locality, and is in coll. Holland.

Coptopteryx nigraria, nov.

♂. Palpi, frons, head, and fore-part of thorax pinkish-red, rest of the body and the wings above dark purplish-brown, striated evenly with purple; the apex of fore-wing is not produced, the excavation below the middle of the outer margin is deep and makes the upper part look square-shaped; there is a blackish suffused patch at the excavation, a suffused shade on the lower middle of the wing, and on the medial portion of the hind-wing; there are no other markings visible; the anal tip is pinkish-red, and on the under-side the legs, body, and wings are of the same colour, pale and uniform in shade; there is a large pink patch at apex of fore-wings, pinkish suffusion on outer margin of hind-wings, and the whole of both wings is evenly striated with brown.

Expanse of wings $1\frac{1}{16}$ inches.

Hab. Port Lokko, Sierra Leone (*Penny*).

Genus Hyalornis, Warr., Nov. Zool., i, p. 445 (1894).

Dioptrochasma, Karsch, Ent. Nachr., xxi, p. 378 (1895).

Hyalornis docta.

Foeilla docta, Schaus and Clem., Sierra Leone, p. 39, pl. 3, f. 15 (1893).
Hyalornis docta, Warr., l. c.
Dioptrochasma sphingata, Karsch, l. c., pl. 4, f. 10.

1 ♂, Sierra Leone (*Clemens*).
Karsch's type came from the Cameroons.

Genus Plegapteryx, Herr.-Schäff., Ausser. Schmett., p. 76 (1855).

Syndetodes, Warr., Nov. Zool., ix, p. 535 (1902).

Plegapteryx anomalus.

Plegapteryx anomalus, Herr.-Schäff., l. c., f. 462–463.
Plegapteryx partita, Holland, Ent. News, 1893, p. 173.
Syndetodes segmentata, Warr., l. c.

2 ♂, Sapele, River Niger.
Holland's type from the Ogove River is in coll. Holland, and Warren's type from Ogrugu, River Niger, is in coll. Rothschild; it seems to be a widely-spread species, there being two males in the National Collection from Natal.

Plegapteryx fasciata.

Plegapteryx fasciata, Holland, Ent. News, 1893, p. 172, pl. 9, f. 6.

1 ♂, Ogove River (*Holland*).
The type, a male from the same locality, is in coll. Holland.

Genus Hemicopsis, nov.

♂. Antennæ bipectinated, stalk thick and strong towards base; hind tibiæ with two pairs of spurs, the inner ones long; pectus and fore femora with rough hairs; palpi upturned, well clothed, last joint minute; body stout; fore-wings with the costa nearly straight, apex acute, outer margin rounded; hind-wings with the outer margin at first rounded, but it has two excisions between vein 3 and the anal angle; fore-wings with vein 7 absent, 8, 9 and 10 stalked, 11 from the

cell anastomosing shortly with 12; hind-wings with veins 3 and 4 and 6 and 7 from the angles.

Type, *purpuraria*, nov.

HEMICOPSIS PURPURARIA, nov.

♂. Antennæ red-brown; palpi brown above ochreous beneath; head and body dark purplish-brown, abdomen at the sides crimson; wings paler brown and more purplish, with darker patches here and there, and with a broad band, straight in itself but with sinuous sides, from a little above the middle of the abdominal margin of hind-wings to the costa of fore-wings before the apex; here it is angled to the outer margin below the apex, leaving a pale space there, and then runs right down the outer border, more or less represented on both wings; the under-side is crimson-red, irrorated in parts with purple atoms; a blackish spot at the end of the cell on the hind-wings; a blackish thin straight and even band from the middle of the abdominal margin of hind-wings to the apex of fore-wings, the space outside it on the fore-wings being purplish.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. TONGA, Brit. E. Africa (*Hollis*).

Genus EUPAGIA, Walker, xx, 216 (1860).

EUPAGIA NIGERRIMA, nov.

♂. Antennæ, head, body, and fore-wings deep black; fore-wings with a very fine discal line, whitish and with some white points, and some very minute white points between it and the outer margin; hind-wings dull pale black, palest towards costa; a dull black rather sinuous discal line; under-side of a pale sordid blackish-brown, with the discal lines visible.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. ABYSSINIA (*Degen*).

Genus GONODONTIS, Hübn., Verz., p. 287 (1818).

GONODONTIS AZELINARIA, nov.

♀. Palpi, head, thorax, and fore-wings dark fawn-colour irrorated with brown; a thin brown outwardly much curved ante-medial sinuous line; four black spots in the form of a square at the end of the cell with a black dot close below them; a discal brown sinuous line, rather close to the margin, inwardly broadly suffused with brownish fawn-colour, the suffusion in a lesser degree and paler outside the line; hind-wings pale grey irrorated with pale brown atoms,

a discal pale brown line, corresponding to that on the fore-wings, and a brownish spot at the end of the cell; marginal line on both wings brown; under-side very pale grey; a rather prominent brown spot at the end of the cell in all the wings and the discal lines visible.

Expanse of wings $1\frac{7}{10}$ inches.

Hab. KILIMANJARO (*F. J. Jackson*).

GONODONTIS ÆMONIARIA, nov.

♂, ♀. Grey with a slight pinkish tinge; palpi black above; thorax and fore-wings slightly darker than the abdomen and hind-wings; wings irrorated with black atoms; fore-wings with indications of an interior black line, curving slightly outwards, a thin black line a little before the middle commencing with a black streak on the costa and having on it two black points, a large black spot at the end of the cell, a discal more distinct black line, both lines angled outwards above the middle, a black spot on the costa near the apex; hind-wings with indications of a thin discal line; under-side paler; wings with a large black spot at the end of each cell, the discal line on both wings composed of black points.

Expanse of wings $1\frac{7}{10}$ inches.

4 ♂, 1 ♀, mile 478, Uganda Railway (*Betton*).

Genus BISTON, Leach, Edinb. Encycl., ix, p. 134 (1815).

BISTON CALARIA, nov.

♂. Wings grey with a pink tinge; antennæ, palpi, head, and thorax brown, abdomen grey; fore-wings with a brown ante-medial band, rather broad, a discal recurved similar band, inwardly margined by a dark line; hind-wings with a discal corresponding band; all the wings uniform in colour, covered with brown irrorations, and with a black dot at the end of each cell, and a marginal brownish indistinct band; under-side paler than upper-side, wings irrorated with brown, the discal bands very thin, the cell spots as above.

Expanse of wings $1\frac{7}{10}$ inches.

Hab. EB URRU, Brit. E. Africa (*Betton*).

Genus BUZURA, Walker, xxvi, 1531 (1862).

BUZURA ANALIPLAGA.

Buzura analiplaga, Warr., Nov. Zool., iv, p. 244 (1897).

1 ♂, Sapele, River Niger.

The type, a male from Warri, Niger coast, is in coll Rothschild.

Buzura abruptaria.

Boarmia abruptaria, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 37 (1869).

1 ♂, Congo (type). 1 ♂, Old Calabar.

Genus Xylopteryx, Guen., Phal., i, p. 215 (1857).

Xylopteryx protearia.

Xylopteryx protearia, Guen., l. c., pl. 4, f. 8.
Scotosia lucidiscata, Walker, xxvi, 1724 (1862).
Scotopterix interposita, Warr., Nov. Zool., ix, p. 526 (1902).

2 ♂, 2 ♀, Masai, E. Quaso, Brit. E. Africa. 1 ♀, Nairowa, Brit. E. Africa. 1 ♀, Eb Urru, Brit. E. Africa. 1 ♂, Kikuyu, Brit. E. Africa. 1 ♂, 2 ♀, mile 478, Uganda Railway.

Walker's type is from S. Africa in this Museum; Guenée's type also came from S. Africa. Warren's type from the Escarpment is in coll. Rothschild.

In Nov. Zool., x, p. 275, Warren says his *versicolor* is the same as *protearia*; there is some mistake here, he was probably writing from memory; *interposita* is undoubtedly the same; *versicolor* and its aberrations are so much larger, they can hardly be put in the same form.

Xylopteryx albimaculata.

Scotopterix albimaculata, Warr., Nov. Zool., ix, p. 525 (1902).

5 ♂, 1 ♀, mile 478, Uganda Railway, Brit. E. Africa. 1 ♀, mile 469, Ndimu, Uganda Railway, Brit. E. Africa. 1 ♂, 3 ♀, E. Quaso, Masai, Uganda Railway.

Warren's type, a female from the Escarpment, is in coll. Rothschild; it is an extreme form with the white spot at apex and the other in the middle of outer margin very white and prominent; in some examples these spots are nearly obsolete, and in others there is a large whitish patch in the middle of the wing.

Xylopteryx versicolor.

Scotopterix versicolor, Warr., Nov. Zool., ix, p. 526 (1902), and x, p. 275 (1903).
ab. *albimedia*, Warr., l. c., ix, p. 526.
ab. *figurata*, Warr., l. c.

2 ♀, mile 478, Uganda Railway.

Warren's types from the Escarpment are in coll. Rothschild; a very variable insect.

XYLOPTERYX BRUNNEATA.

Xylopteryx brunneata, Warr., Nov. Zool., ix, p. 523 (1902).

1 ♂, 1 ♀, Curepipe, Mauritius. 1 ♀, Madagascar.

The type, a female from Great Comoro, is in coll. Rothschild; it is very doubtfully distinct from *serrataria*, Walker; the Mauritius examples are not typically of either form, but the Madagascar female is identical with Warren's type.

XYLOPTERYX CEPHALOTES.

Scodiona cephalotes, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 376, pl. 7, f. 14 (1869).

1 ♂, Congo (type).

This is a very curious insect, and in its barred markings beneath is unlike any other species in this Family; the example is not in good condition and has lost its abdomen; when more are obtained for examination a new genus will probably be necessary for it, it certainly is not a *Scodiona*; I put it into this genus tentatively.

Genus CATASCIA, Hübner, Verz., p. 313 (1818).

CATASCIA CONFUSATA.

Catascia confusata, Warr., Nov. Zool., ix, p. 523 (1902).

1 ♀, mile 478, Uganda Railway.

The type, a male from the Escarpment, is in coll Rothschild.

Genus ŒDICENTRA, Warr., Nov. Zool., ix, p. 524 (1902).

ŒDICENTRA ALBIPENNIS.

Œdicentra albipennis, Warr., l. c., p. 525.

1 ♂, Nairobi, Brit. E. Africa.

The type, a male from the Escarpment, Brit. E. Africa, is in coll. Rothschild; there is also an example in the B. M. marked S. Africa.

ŒDICENTRA GERYDARIA, nov.

♂. White sparsely irrorated and striated with grey; antennæ black; a black spot at the end of each cell, and on the fore-wings an inner evenly outwardly curved thin grey band; both wings with a sinuous discal brown line, marked with black in parts, some grey marks near the outer margin, and a black streak at the anal angle of the hind-wings; body and wings below white, the band and markings blacker, broader and more pronounced, legs with black spots and streaks.

Expanse of wings $1\frac{3}{10}$ inches.

Hab. ASHANTI (*Bergman*).

Allied to the preceding, differs much in the shape of the inner band of the fore-wings.

Genus ECTROPIS, Hübn., Verz., p. 299 (1818).

ECTROPIS OCELLATA.

Ectropis ocellata, Warr., Nov. Zool., ix, p. 520 (1902).

1 ♀, mile 478, Uganda Railway, Brit. E. Africa. 2 ♀, Lagari, Brit. E. Africa.

The types from the Escarpment are in coll. Rothschild.

ECTROPIS SQUALIDA.

Ophthalmodes squalida, Butler, Ann. Mag. N. H. (5), ii, p. 465 (1878).

1 ♀, Aburi. 1 ♀, Old Calabar (type).

ECTROPIS ZEBRINA.

Racotis zebrina, Warr., Nov. Zool., vi, p. 56 (1899).

1 ♂, without locality. 1 ♀, Old Calabar. 1 ♀, Sapele, River Niger.

The type, a male from Warri, is in coll. Rothschild.

This is probably a form of *squalida*.

ECTROPIS NACARIA, nov.

♀. Body and fore-wings olive-brown, frons and top of head ochreous-white; fore-wings striated with whitish fine marks, and also with dark olive-brown; two ochreous-whitish transverse bands, the first before the middle, nearly upright, with sinuous sides and brown centre, the other discal, elbowed outwards above the middle, and containing a blackish sinuous line in its middle; a dark brown large

spot just below the outer end of the elbow, and some paler brown spots below it; a pale space connecting the brown spot with the margin; hind-wings pale olive-brown; a brown spot at the end of the cell, an obscure discal whitish band with some brown marks in it, an obtuse and much broader brown band between it and the outer margin, which is sordid ochreous; both wings with black marginal lunules and blackish patches on the sordid ochreous cilia; under-side whitish irrorated with brown, a brown spot at the end of each cell and a broad discal black band, connected with the outer margin below the apex on the fore-wings.

Expanse of wings $1\frac{4}{10}$ inches.

Hab. Ashanti (*Bergman*).

Genus Ascotis, Hübn., Verz., p. 313 (1818).

Ascotis selenaria.

Geometra selenaria, Schiff, Wien Verz., 101, 7 (1776).
Boarmia reciprocaria, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 366 (1869).
Ascotis selenaria, var. *fasciata*, Warr., Nov. Zool., iv, p. 92 (1897).

1 ♂, Congo (type *reciprocaria*). 1 ♂, Eb Urru, Brit. E. Africa. 1 ♀, mile 478, Uganda Railway.

Warren's type, a female from Grahamstown, is in coll. Rothschild; it is a very curious variety with a broad chocolate band across the disc of both wings; there is a male from Natal in the B. M. similarly coloured, and so is the female from the Uganda Railway above referred to.

Genus Boarmia, Treit., Schmett. Eur., v, ii, p. 433 (1825).

Boarmia marmorata.

Chogada marmorata, Warr., Nov. Zool., iv, p. 247 (1897).

2 ♂, 1 ♀, Mauritius.

The type, a male from Mauritius, is in coll. Rothschild; it is one of numerous local forms of *B. acaciaria*, Boisd., but is a good form.

Boarmia acaciaria.

Boarmia acaciaria, Boisd., Faun. Ent. Madag., p. 116, pl. 16, f. 4 (1834).
Chogada betularia, Warr., Nov. Zool., iv, p. 93 (1897).

Chogada acaciaria, var. *innsitata*, Warr., l. c., v, p. 248 (1898).

1 ♂, Old Calabar. 1 ♂, 1 ♀, Kikuyu, Brit. E. Africa. 1 ♂, mile 478, Uganda Railway. 1 ♀, Eb Urru, Brit. E. Africa.

Warren's types, from S. Africa and Warri, are in coll. Rothschild; they are varieties of this very variable species; there are many examples in the B. M. from S. Africa, hardly any two of them alike; it is also doubtful whether the next is a distinct form.

Boarmia derogaria.

Boarmia derogaria, Snellen, Tijd. v, Ent. (3), vii, p. 75, pl. 6, f. 3 and 6 (1872).
Chogada subspurcata, Warr., Nov. Zool., v, p. 248 (1898).

1 ♀, Old Calabar.

Warren's type, from S. Africa, is in coll. Rothschild; Snellen's type, from Lower Guinea, is in coll. Snellen; it is very doubtfully distinct from the common Eastern species *B. compactaria*, Walker, xxvi, 1538.

Boarmia dribraria, nov.

♂. Ochreous-white, tinged with pink, especially on the fore-wings; some brown irrorations on the palpi, head, thorax and fore-wings; spots and markings blackish-brown; fore-wings with five short bands from the costa, like the commencement of transverse bands; the first is basal, the last subapical, and they are all about equal distances apart; below the third there are two sinuous thick transverse lines reaching the hinder margin; below the last two costal marks are two patches with another on the margin in echelon; there are some spots on the outer margin and patches on the white cilia; the hind-wings are nearly white with a spot at the end of the cell, some along abdominal margin, two rows of them before the outer margin, and a row of discal dots; the under-side is much as upper-side, but the markings are more pronounced, and there is a white apical patch on the fore-wings.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. Madagascar (*Cowan*).

Belongs to the *glabraria* group.

Boarmia vicaria.

Angerona (?) *vicaria*, Walker, xx, 243, ♀ (1860).

Angerona patulata, Walker, xxvi, 1500, ♂ (1862).
Gnophos conturbata, Walker, xxvi, 1751, ♂.

1 ♀, W. Africa (type).
The other two types, both males, are from the Cape.

Boarmia sublutea.

Emmelesia sublutea, Butler, Ann. Mag. N. H. (5), vi, p. 392 (1880).

1 ♂, 2 ♀, Madagascar, including the type.

Boarmia ugandaria, nov.

♂. Antennæ and palpi blackish-brown, tips of latter ochreous; head, body, and wings with the ground-colour ochreous thickly striated with olive-brown; a large brown spot at the end of each cell; the striations close on the basal half of both wings and on the outer portions, leaving a paler space almost like a band in the middle; fore-wings with a line of pale lunules near the outer margin, filled in with blackish-brown spots; hind-wings with a prominent submarginal ochreous line very slightly sinuous in parts; both wings with a marginal black lunular line, brown cilia with an ochreous line at their base, and with ochreous spots; under-side pale ochreous-grey; cell spots as above, the striations paler, the fore-wings with a broad olive-brown discal band, touching the margin in parts, leaving ochreous spaces at the apex and in the middle.

Expanse of wings $2\frac{2}{16}$ inches.

Hab. Entebbe, Uganda, July 1889 (*Rattray*).
Belongs to the *Alcis* group.

Boarmia diffusa.

Tephrosia diffusa, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 374 (1869).
Alcis smithi, Warr., Nov. Zool., ix, p. 519 (1902).

1 ♀, Congo (type).
Warren's type, a male from Yakusu, Upper Congo, is in coll. Rothschild.

Boarmia assimilis.

Selidosema assimilis, Warr., Nov. Zool., ix, p. 522 (1902).
„ ab. *separata*, Warr., l. c.

1 ♂, 1 ♀, Ndimu, mile 469, Uganda Railway, Brit. E.

Africa. 2 ♀, Ndimu, mile 469, Uganda Railway, Brit. E. Africa (var. *separata*).

Warren's types from the Escarpment are in coll. Rothschild.

Boarmia divisaria.

Boarmia divisaria, Walker, xxi, 366 (1860), nec 489.
Boarmia separaria, Moesch., Abh. Senck. Ges., xv, p. 92, ♀ (1889).
Alcis rufilimes, Warr., Nov. Zool., vi, p. 51 (1899).

1 ♀, Old Calabar.

The type, a female from Natal, is in this Museum, as also a male and female from S. Africa. Warren's types from Warri are in coll. Rothschild.

Genus Caradrinopsis, nov.

♂. Antennæ almost simple; palpi porrect, short and blunt, last joint minute; abdomen slender, extending one-third beyond hind-wings; hind tibiæ with two pairs of short spurs; wings narrow, fore-wing elongated, veins 3 and 4 from end of cell, 6 from upper end, 7, 8 and 10 stalked, 9 absent, 11 from the cell, which is more than half the length of the wing; hind-wings with vein 2 from one-third, 3 from close before, 4 from end of cell, 6 and 7 from upper end.

Type *C. obscuraria*, nov.

Caradrinopsis obscuraria, nov.

♂. Antennæ, palpi, head, body, and fore-wings greyish-fawn colour, with an ochreous tinge and thickly irrorated with grey atoms; a brownish obscure spot at the end of the cell, and some similar submarginal markings; hind-wings white with an obscure grey spot at the end of the cell, no other markings; under-side, body, legs and wings white, a brownish spot at the end of each cell; fore-wings with a subapical short grey band; hind-wings with a submarginal brownish macular band, composed of three spots downwards from the costa and one spot near anal angle.

Expanse of wings 1 inch.

Hab. Moani, Brit. E. Africa (*Betton*).

Like a little Noctuid of the genus *Caradrina*.

Genus Hemerophila, Steph., Ill. Brit. Ent. Haust., iii, p. 189 (1829).

Hemerophila olginaria, nov.

♂. Of a uniform ochreous-grey, tinged with pink; antennæ and

palpi above brown; abdomen with brownish segmental bands; wings covered with grey irrorations; fore-wings with two oblique black lines, one from the hinder margin at one-third, towards end of cell, where it is acutely bent inwards, then upwards, the other from the middle to near the apex, where it is acutely bent inwards and then upwards to the costa near the apex; hind-wings with a discal line nearly straight and indications of several brownish very obscure parallel bands; marginal line of both wings black; cilia grey with a pale base; under-side uniformly pale grey, the discal lines prominent, fore-wings with some brown suffusion near outer border and an ochreous patch at apex.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. NAITOLIA, Brit. E. Africa (*Betton*).

HEMEROPHILA MAILARIA, nov.

♂. Uniformly grey, the ground-colour being white thickly covered with very minute ochreous-grey irrorations; antennæ and upper side of palpi brown; fore-wings with two oblique sinuous black lines, the first from the hinder margin at one-third towards end of cell, the second from the middle running parallel with the first but continued to near the apex; on the outer sides of each of these lines and on the costa are shades of grey suffused bands; hind-wings with an internal grey band corresponding with the outer line of the fore-wings, a discal black line, and indications of a submarginal grey band; a large brown spot at the end of each cell of both wings, a brown marginal line, and whitish cilia; under-side whitish, a brown spot at the end of each cell, no other markings.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. CONGO (*Marsden*).

Genus NOTHABRAXAS, Warr., Nov. Zool., iv, p. 88 (1897).
HAMEOPIS, Butler, P. Z. S., 1898, p. 435.

NOTHABRAXAS RUDICORNIS.

Hameopis rudicornis, Butler, l. c., pl. 32, f. 13.

1 ♂, Taru, Brit. E. Africa (type).

NOTHABRAXAS COMMACULATA.

Nothabraxas commaculata, Warr., Nov. Zool., iv, p. 88 (1897).

1 ♀, Kikuyu, Brit. E. Africa.

The type, a male from Mpwapwa, E. Africa, is in coll. Rothschild; there is also a male from Rhodesia in the B. M.

NOTHABRAXAS ROSEOVITTATA.

Heterabraxas roseovittata, Butler, P. Z. S., 1895, p. 741, pl. 43, f. 2, 3.

1 ♂, West of Lake Nyassa (type).
1 ♀, Kampala, Uganda (type).

NOTHABRAXAS SIMPLEX.

Rhodophthitus (?) *simplex*, Warr., Nov. Zool., iv, p. 89 (1897).
Rhodophthitus (?) *roseus*, Warr., l. c., vi, p. 304 (1899).

Warren's type, a female which has lost nearly all its colour, from Songive Valley, Lake Nyassa, and his type of *roseus*, which is in fresh condition, a female from Mashonaland, are both in coll. Rothschild; it is represented in this Museum only from S. Africa.

Genus RHODOPHTHITUS, Butler, Ann. Mag. N. H. (5), vi, p. 392 (1880).

RHODOPHTHITUS FORMOSUS.

Rhodophthitus formosus, Butler, l. c.

1 ♂, Madagascar (type).

Genus NEGLA, Walker, xxiv, 1087 (1862).
Narthecusa, Walker, xxiv, 1140.

NEGLA TENUIORATA.

Narthecusa tenuiorata, Walker, xxiv, 1140.
Endropia nachtigalii, Dewitz, Verh. Leop.-Carol. Akad., xlii, p. 83, pl. 2 f. 8–10 (1881).

2 ♂, 2 ♀, Ashanti, including the types. 2 ♂, Gaboon.
Very variable.

NEGLA PERPLEXATA.

Negla perplexata, Walker, xxiv, 1087.
Endropia packardii, Dewitz, Verh. Leop.-Carol. Akad., xlii, p. 84, pl. 2, f. 5, ♀, 6 ♂ (1881).

1 ♂, Ashanti (type). 1 ♂, Onitsha, River Niger. 1 ♂, Port Alice, W. Africa.
Very variable.

Genus AMNEMOPSYCHE, Butler, P. Z. S., 1869, p. 66.

Girpa, Walker, xxxi, 209 (1864) (praeocc.).
Hylemera, Butler, Ann. Mag. N. H. (5), ii, p. 293 (1878).

Butler's Genus *Hylemera* only differs from *Amnemopsyche* in having the fore-wings shorter, the cell therefore being comparatively longer; the venation is identical.

AMNEMOPSYCHE CHARMIONE.

Papilio charmione, Fabr., Ent. Syst., iii (1), p. 205 (1793).
Hylemera nummulifera, Warr., Nov. Zool., iv, p. 397 (1897).

1 ♀, Island of Johanna (type). 1 ♂, 1 ♀, Isubu. 1 ♀, Nassau, River Ogoway. 2 ♂, Abutshi, S. Nigeria.
Warren's type, a male from Bopoto, Upper Congo, is in coll. Rothschild.

AMNEMOPSYCHE CIRCUMDATA.

Girpa circumdata, Walker, xxxi, 209 (1864).

1 ♂, 1 ♀, Congo (type). 1 ♂, Cameroons.

AMNEMOPSYCHE RENIFERA.

Hylemera renifera, Warr., Nov. Zool., iv, p. 397 (1897).

2 ♂, Sierra Leone.
The type, a male from Sierra Leone, is in coll. Rothschild.

AMNEMOPSYCHE TENUIS.

Hylemera tenuis, Butler, Ann. Mag. N. H. (5), ii, p. 294 (1878).

1 ♂, Madagascar (type).

AMNEMOPSYCHE CANDIDA.

Hylemera candida, Butler, Ent. Mo. Mag., xix, p. 58 (1882).

1 ♂, Madagascar (type).

AMNEMOPSYCHE NIVEA.

Hylemera nivea, Butler, Ent. Mo. Mag., xix, p. 58 (1882).

1 ♂, Madagascar (type).

Amnemopsyche fragilis.

Hylemera fragilis, Butler, Ann. Mag. N. H. (5), iv, p. 236 (1879).

3 ♂, Madagascar, including the type.

Amnemopsyche puella.

Hylemera puella, Butler, Ann. Mag. N. H. (5), iv, p. 236 (1879).

1 ♂, Madagascar (type).

All these four names will probably fall into one somewhat variable species when we have more material to work on.

Genus Provola, nov.

♀. Antennæ shortly pectinated; fore-wing with the cell more than half the length of the wing; discocellulars vertical and short; vein 2 from the middle of the cell, 3 from five-sixths before the end, 4 from the end, 5 from just above 4, 7 and 8 stalked, 11 out of 12, 9 and 10 coincident and anastomosing with 11, 9 again anastomosing with 8, thus forming a double areole; hind-wing with vein 5 absent, 7 from just before the end of the cell.

Type *P.* (*Aletis*) *postica*, Walker.

Provola postica.

Aletis postica, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 332, pl. 5, f. 4 (1869).

2 ♀, Congo, including the type.

Superficially much resembling *Aletis helcita*, Clerck, but that genus has vein 5 in the hind-wings present, and has veins 7 and 8 connected by a bar near the base; the neuration of this species is much more nearly akin to that of the genus *Pitthea* and it is in every respect a true *Boarmid*, except that the origin of vein 5 of the fore-wings is close above that of vein 4, which is not usual in this family.

Genus Pitthea, Walker, ii, 463 (1854).

Turckheimeria, Dewitz, Verh. Leop.-Carol. Akad., xlii, p. 81 (1881).

Hymenocharta, Warr., Nov. Zool., iv, p. 84 (1897).

PITTHEA PERSPICUA.

Bombyx perspicua, Linn., Syst. Nat., i, p. 505 (1758).
Leucopsumis cryptochroma, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 331, pl. 5, f. 3 (1869).

1 ♂, 1 ♀, Congo (Walker's types).

PITTHEA CONTINUA.

Pitthea continua, Walker, ii, 463 (1854).
Pitthea abbreviata, Warr., Nov. Zool., vi, p. 47 (1899).

3 ♂, Lagos. 1 ♀, Sierra Leone. 1 ♂, 1 ♀, Ashanti. 3 ♂, 1 ♀, Opobo. 1 ♂, 1 ♀, Old Calabar. 1 ♂, Congo. 1 ♂, Gaboon. 1 ♂, Cameroons.

Warren's type, a male from Warri, is in coll. Rothschild; the bands are narrower than usual, but there is no other difference, and the Congo example is identical with it.

PITTHEA TRIFASCIATA.

Turckheimeria trifasciata, Dewitz, Verh. Leop.-Carol. Akad., xlii, p. 82, pl. 3, f. 3 (1881).
Hymenocharta triplagiata, Warr., Nov. Zool., iv, p. 84 (1897).

1 ♀, Niger. 1 ♂, Mombasa. 1 ♂, Mgana, Brit. E. Africa. 1 ♂, Zanzibar. 1 ♂, Mashonaland.

Dewitz' type came from Zanzibar; the type of *triplagiata*, from Dar-es-Salaam, German E. Africa, is in coll. Rothschild.

PITTHEA FAMULA.

Bombyx famula, Drury, Ill. Exot. Ent., ii, pl. 11, f. 3 (1773).
Nyctemera expandens, Walker, ii, 398 (1854).
Nyctemera decisa, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 330, pl. 5, f. 2 (1869).

2 ♂, 1 ♀, Old Calabar. 2 ♂, Sierra Leone. 3 ♂, 1 ♀, River Niger. 2 ♀, Angola, including the type of *expandens*. 1 ♂, Congo.

Family GEOMETRINÆ.

Genus PSEUDOTERPNA, Hübn., Verz., p. 284 (1818).

PSEUDOTERPNA RUGINARIA.

Hypochroma ruginaria, Guen., Phal., i, p. 278 (1857).
Hypochroma commutata, Walker, xxi, 429 (1860).

Hypochroma communicans, Walker, xxi, 430.
Hypochroma perfectaria, Walker, xxi, 434.
Hypochroma nyctemerata, Walker, xxi, 444, xxvi, 1543.
Hypochroma grandidieri, Butler, Cist. Ent., ii, p. 394 (1879).
Pingasa decristata, Warr., Nov. Zool., ix, p. 492 (1902).

1 ♂, Sierra Leone (type *commutata*). 1 ♀, without locality (type *nyctemerata*). 1 ♂, Madagascar (type *grandidieri*).

Warren's type, a male from St. Thomé, W. Africa, is in coll. Rothschild; it is a small example, but I cannot separate it. Guenée's type came from N. India; the type of *perfectaria* from India is in Mus. Oxon.; the type of *communicans* is in the B. M. from Natal, and there are many examples from India, Burma, the Andamans and Singapore, which all certainly belong to one widely-spread species.

Pseudoterpna rhadamaria.

Hypochroma rhadamaria, Guen., Phal., i, p. 277 (1857).
Hypochroma altcrata, Walker, xxi, 428 (1860).
Pingasa interrupta, Warr., Nov. Zool., viii, p. 204 (1901).

1 ♂, Kilimanjaro.

Guenée's type came from Madagascar; Walker's type from Natal is in the B. M., and Warren's type from Rau, Nandi country, is in coll. Rothschild; I doubt whether it is distinct from *ruginaria*; it appears to me to be only a form of it without any yellow on the under-side.

Pseudoterpna attenuans.

Hypochroma attenuans, Walker, xxi, 430 (1860).

1 ♀, Sierra Leone (type).

Genus Xenochroma, Warr., Nov. Zool., ix, p. 497 (1902).

Xenochroma candidata.

Xenochroma candidata, Warr., l. c., p. 498.

1 ♀, Teita, E. Africa.

The type, a female from Kilwa, German E. Africa, is in coll. Rothschild.

Genus Mimandria, Warr., Nov. Zool., ii, p. 88 (1895).

Mimandria insularis, nov.

♂, ♀. Of a uniform pale greyish-white, tinged with ochreous, covered with minute grey irrorations; a grey lunular mark at the end of each cell; fore-wings with two transverse outwardly curved ochreous-grey lines, the former ante-medial and sinuous, the latter discal, dentated and more rounded; hind-wings with a similar discal line, a row of greyish-ochreous spots outside this line on both wings, and marginal lunules of the same colour; under-side paler and more sordid grey, both wings with grey cell-spots, a crenulated discal thin grey band and grey lunules in the outer margin.

Expanse of wings, ♂ $1\frac{3}{10}$, ♀ $1\frac{5}{10}$ inches.

5 ♂, 1 ♀, Madagascar (*Cowan*).

It is a curious fact that though Warren made this species the type of his Genus he forgot to describe it.

Genus Synclysmus, Butler, Ann. Mag. N. H. (5), iv, p. 242 (1879).

Synclysmus niveus.

Synclysmus niveus, Butler, l. c.

2 ♂, Madagascar, including the type.

Genus Episothalma, Swinhoe, Ann. Mag. N. H. (6), xii, p. 149 (1893).

Episothalma marginata.

Episothalma marginata, Warr., Nov. Zool., iv, p. 38 (1897).

1 ♂, Freetown, Sierra Leone.

Warren's type, a male from the same locality, is in coll. Rothschild.

Episothalma kabaria, nov.

♂. Palpi, antennæ, frons, and head brown-pink, body paler; both wings of a uniform dark grass-green; costa of fore-wings brown-pink, rather broadly at the base and narrowing towards apex; a thin band of the same colour on the outer margin of both wings, limited inwardly by a very sinuous brown line, inside the band being several whitish spots, the largest at the apex of fore-wings; there are some pale streaks in all these examples, but these are no doubt caused by loss of colour, so often occurring in green moths; under-side uniform

pale pink, the costal line of both wings dark pink, the outer border as above, but with the ground-colour pale black ; body and legs pink.

Expanse of wings $\frac{9}{10}$ inch.

3 ♂, Sierra Leone (*Clements*).

Allied to *E. maryinata*, Warr.

Episothalma subfuscata.

Episothalma subfuscata, Warr., Nov. Zool., ix, p. 494 (1902).

1 ♂, Old Calabar. The type, a male from Oguta, Niger, is in coll. Rothschild.

Genus Agathia, Guen., Phal., i, p. 380 (1857).

Agathia elenaria, nov.

♂, ♀. Pale green, upper part of palpi, head, thorax, and basal patch on both wings chocolate-brown ; palpi white beneath ; thorax with a green stripe on the front and at the sides; abdomen pale brown, white at the sides and at the tip ; a thin very zigzag chocolate-brown transverse band on the fore-wings a little before the middle ; a similar coloured thin discal band across both wings, rather close to the margin, and joined to the margin at the middle on the fore-wings and at the tail on the hind-wings, from which to the anal angle the marginal space is entirely brown ; there is also a small brown spot at the apex of fore-wings. The female is similar to the male, except that the discal band on both wings is very broad, on the hind-wings occupying more than half the wing, leaving only a small pale space on the outer margins ; the under-side in both sexes is pure white with the discal band more or less as above.

Expanse of wings $1\frac{2}{10}$ inches.

♂, Old Calabar (*Crampton*). ♀, Sapele, River Niger (*Sampson*).

Agathia multiscripta.

Agathia multiscripta, Warr., Nov. Zool., v, p. 233 (1898).

2 ♀, Cameroons.

The type, a female from Warri, Niger Coast, is in coll. Rothschild.

Genus Tanaorhinus, Butler, Ill. Het., B. M., iii, p. 38 (1879).

Tanaorhinus humidaria, nov.

♂. Tips of palpi and plumes of the antennæ blackish-brown,

remainder of palpi, frons, and shafts of the antennæ bright orange-ochreous, top of head pure white ; body and wings of a uniform dark ochreous-grey, striated with dull dark green, the striations thickened in the middle, forming a broad transverse band across both wings, with a corresponding band on the abdomen ; under-side paler, with the band complete on fore-wings, and only on lower half of hind-wings. This is the description of the type specimen, but the species varies considerably ; two examples are tinged with red, especially on the under-side ; in others the medial band is more or less obsolete, in one example there is no sign of it above or below.

Expanse of wings $1\frac{4}{10}$ inches.

5 ♂, Madagascar (*Cowan*).

Genus Euchloris, Hübn., Verz., p. 283 (1818).

Pareuchloris, Warr., Nov. Zool., i, p. 386 (1894).
Comostolopsis, Warr., l. c., ix, p. 494 (1902).

Euchloris simplex.

Comostolopsis simplex, Warr., l. c.

1 ♂, Kikuyu, Brit. E. Africa. 1 ♂, Ndimu, mile 469, Uganda Railway, Brit. E. Africa.

The types from the Escarpment are in coll. Rothschild ; it is very doubtfully distinct from *Pareuchloris apicata*, Warr., Nov. Zool., v, p. 14 = *Phorodesma* (?) *fuscipuncta*, Warr., l. c., vi, p. 291, both from South Africa, and *stillaria*, Felder, Reise, Nov., pl. 127, f. 17.

Genus Syndromodes, Warr., Nov. Zool., iv, p. 45 (1898).

Syndromodes pulchrifimbria.

Syndromodes pulchrifimbria, Warr., l. c., ix, p. 496 (1902).

1 ♂, 2 ♀, Nairowa, Brit. E. Africa. 1 ♂, Ndimu, mile 469, Uganda Railway.

The type, a male from the Escarpment, is in coll. Rothschild.

Syndromodes sabiata.

Racheospila sabiata, Felder, Reise, Nov. Lep., pl. 127, f. 36 (1874).
Syndromodes rubridentata, Warr., Nov. Zool., iv, p. 213 (1897).

1 ♂, Brit. E. Africa. 1 ♂, Accra.

Felder's type a male from Natal, and Warren's type a female from Dar-es-Salaam, are both in coll. Rothschild. Felder calls his a female, but his figure is that of a male.

Syndromodes cœrulea.

Microloxia (?) *cærulea*, Warr., Nov. Zool., iii, p. 368 (1896).
Syndromodes cærulea, Warr., l. c., vi, p. 27 (1899).

1 ♂, Appan, Gold Coast.
The type, a male from Songive Valley, Lake Nyassa, is in coll. Rothschild.

Genus Thalassodes, Guen., Phal., i, p. 359 (1857).

Thalassodes congrua.

Geometra congrua, Walker, Proc. N. H. Soc. Glasg., 1. (ii), p. 371 (1869).
Thalassodes nigripunctata, Warr., Nov. Zool., iv, p. 46, ♂ (1897).
,, ,, Warr., l. c., v, p. 237, ♀ (1898).

1 ♂, Congo (type). 2 ♂, 2 ♀, Old Calabar. 1 ♀, Lagos. 1 ♀, Sapele, River Niger.
Warren's types from the Cameroons and Uganda are in coll. Rothschild.

Thalassodes salutaria, nov.

♀. Antennæ, palpi, frons, head, and abdomen white, thorax and wings of a uniform bright green colour; costal line of fore-wings brown-pink; a black dot at the end of each cell; cilia white variegated with green and brown-pink patches; under-side of wing pale green; body and legs whitish, no markings.
Expanse of wings 1 inch.

Mile 478, Uganda Railway (*Betton*).

Thalassodes hadrata.

Nemoria (?) *hadrata*, Felder, Reise, Nov. Lep., pl. 127, f. 27, ♂ (1874).

1 ♀, Gold Coast.
The type from Knysna is in coll. Rothschild.

Genus Prasinocyma, Warr., Nov. Zool., iv, p. 44 (1897).

Prasinocyma pulchraria, nov.

♂, ♀. Bright green, striated with white; palpi and frons red-pink; antennæ pinkish-grey; abdomen whitish; head, thorax, and wings green, costal line of fore-wings red-pink, a black dot at the end of each cell; under-side, body and legs whitish, wings pale green, outer margin with black dots.

Expanse of wings $1\frac{3}{16}$ inches.

1 ♂, Ngong, Machakos to Neugia (*Crawshay*) (type). 1 ♀, Old Calabar (*Crompton*) (type). 2 ♂, Machakos.

PRASINOCYMA ASYLLARIA, nov.

♀. Antennæ, palpi, and frons pinkish-ochreous, abdomen whitish; head, thorax, and wings grass-green; fore-wings with a black spot at the end of the cell and the costal line ochreous, both wings with the cilia white marked with green; under-side as above but paler; body whitish, legs pinkish-ochreous.

Expanse of wings $1\frac{2}{16}$ inches.

2 ♂, Madagascar (*Mrs. Kingdon*).

The branches of the antennæ are rather longer than in the other species of this Genus.

PRASINOCYMA UNIPUNCTA.

Prasinocyma unipuncta, Warr., Nov. Zool., iv, p. 44 (1897).

1 ♀, Munisu, Brit. E. Africa. 1 ♂, Machakos, Brit. E. Africa. 1 ♂, Gwelil, Brit. E. Africa. 1 ♂, Nairowa, Brit. E. Africa.

The type, a male from Natal, is in coll. Rothschild; it is smaller than the above, but otherwise not different.

Genus GELASMA, Warr., P. Z. S., 1893, p. 352.

GELASMA COWANI.

Thalera cowani, Butler, Ann. Mag. N. H. (5), v, p. 390 (1880).

1 ♂, Madagascar (type).

GELASMA ZEBRÆA.

Nemoria zebræa, Saalm., Lep. Madag., p. 495, pl. 14, f. 264 (1884).

1 ♂, Madagascar.

Genus Thalera, Hübn., Verz., p. 285 (1818).

Thalera oblongata.

Thalera oblongata, Warr., Nov. Zool., v, p. 17 (1898).

1 ♂, Sierra Leone.

The type, a female from Warri, Niger Coast, is in coll. Rothschild.

Thalera (?) turpisaria, nov.

♂. Palpi and frons dark brownish-black, antennæ, head, thorax and first two segments of the abdomen dull greenish-ochreous, remaining segments dark brown; wings dull greenish-ochreous, fore-wings slightly suffused with dull green in the interior parts; a brown spot at the end of the cell, some brown dots on the costal margin, and a brown thin discal band, erect from the hinder margin near the angle to vein 6; hind-wings more thickly and darkly suffused with green, the suffusion covering the whole of the upper portion of the wings, and running to the abdominal margin in the form of three bands; under-side strongly tinged with pink, with greenish-brown suffusion on the lower portions of fore-wings and over nearly all the hind-wings; two middle transverse bands, both of which on the fore-wings stop short of the costa; a brown spot at the end of each cell.

Expanse of wings 1 inch.

Hab. Sapele, River Niger (*Sampson*).

The insect has lost its hind-legs, therefore I cannot properly place it; it has bipectinate antennæ like a *Thalera* and veins 3 and 4 of the hind-wings are stalked, but there is no excision between veins 3 and 4.

Genus Xanthodura, Butler, Ann. Mag. N. H. (5), v, p. 384 (1880).

Xanthodura trucidata.

Xanthodura trucidata, Butler, l. c., p. 385.

1 ♂, Madagascar (type).

Genus Antharmostes, Warr., Nov. Zool., vi, p. 21 (1899).

Antharmostes interalbicans.

Antharmostes interalbicans, Warr., l. c., ix, p. 493 (1902).

1 ♂, Ashanti.
The type, a male from the Upper Congo, is in coll. Rothschild.

Genus HEMITHEA, Dup., Lep. France, iv (2), p. 233 (1829).

HEMITHEA SAPOLIARIA, nov.

♂, ♀. Palpi, frons, and head ochreous-brown, antennæ and abdomen whitish, thorax and wings green, striated with white; costa of fore-wings ochreous-grey; a discal transverse whitish line across both wings nearly straight and upright, but angled on the hind-wings in conformity with the shape of the outer margin; cilia whitish; under-side, wings paler, otherwise as above; body and legs ochreous-white.

Expanse of wings $1\frac{1}{16}$ inches.

1 ♂, Mombasa (*J. D. McCay*). 1 ♀, Old Calabar.
Though these sexes came from the East and West, there can be no question as to their identity.

Genus AGRAPTOCHLORA, Warr., Nov. Zool., i, p. 389 (1894).

AGRAPTOCHLORA SUBASPERSA.

Agraptochlora subaspersa, Warr., l. c., p. 390.

1 ♀, Usambara, E. Africa.
The type, a female from South Africa, is in coll. Rothschild.

AGRAPTOCHLORA RUBRIPLAGA.

Agraptochlora rubriplaga, Warr., l. c., iv, p. 33 (1897).

1 ♀, Kui, Brit. E. Africa.
The type, a male from Natal, is in coll. Rothschild.

Genus JODIS, Hübn., Verz., 285 (1818).

JODIS STIBOLEPIDA.

Comibæna stibolepida, Butler, Cist. Ent., ii, p. 394 (1879).

1 ♂, Madagascar (type).

JODIS GLACIALIS.

Thalassodes glacialis, Butler, Ann. Mag. N. H. (5), vi, p. 391 (1880).
„ *pallidulata*, Mab., C. R. Soc. Ent. Belg., xxiii, p. 21, (1880).

1 ♂, Madagascar (type).

Mabille's type also came from Madagascar, the description fits *glacialis* very well.

Genus Gonochlora, nov.

Shaft of the antennæ of the male laminate, with clavate teeth beneath, as in some of the *Drepanulidæ*; fore-wings projecting squarely between veins 3 and 4; hind-wings acutely angled at vein 4 and with a minor angulation at vein 3; hind tibiæ with one pair of terminal spurs; palpi porrect, strong and thick; a development of the genus *Jodis*.

Type *minutaria*, nov.

Gonochlora minutaria, nov.

♂. Dull greenish-ochreous; probably in freshly emerged specimens the colour is grass-green; a black dot at the end of each cell; indications of a transverse sinuous discal line; costal line of fore-wings and marginal line of both wings chestnut-red; under-side white without markings; palpi, frons and head bright orange-ochreous.

Expanse of wings $\frac{7}{10}$ inch.

2 ♂, Sierra Leone (*Clements*).

Genus Nemoria, Hübn., Verz., p. 285 (1818).

Nemoria attenuata.

Nemoria (?) *attenuata*, Walker, xxvi, 1558, ♂ (1862).
Jodis reductata, Walker, xxxv, 1606, ♀ (1866).

4 ♂, 2 ♀, Sierra Leone.

The type male from the Cape is in Mus. Oxon., the type female was in coll. d'Urban, but where that collection now is, is not known; there are several examples of this species in the B. M. from S. Africa, and examples in the Tring Mus. from Sierra Leone and Angola.

Nemoria approximans.

Hemithea approximans, Warr., Nov. Zool., iv, p. 39 (1897).
Nemoria approximans, Warr., l. c., v, p. 235 (1898).

1 ♂, Sierra Leone.

The type, a male from Natal, is in coll. Rothschild.

Nemoria malescripta.

Hemithea malescripta, Warr., Nov. Zool., iv, p. 40 (1897).
Nemoria malescripta, Warr., l. c., v, p. 235 (1898).

1 ♂, Tana River, Brit. E. Africa. 1 ♂, Msokani, Kitwi, Brit. E. Africa. 1 ♂, 1 ♀, Teita, Brit. E. Africa. 2 ♂, 3 ♀, Sierra Leone.

The types from Natal are in coll. Rothschild.

NEMORIA AFFLICTARIA, nov.

♂. Dull greenish-ochreous, probably grass-green when freshly emerged, basal half of antennæ nearly white; wings with a pale bordered grey lunule at the end of each cell; costal line of fore-wings chocolate-brown; a grey discal nearly straight line with pale outer edging from abdominal margin of hind-wings to apex of fore-wings; marginal line grey, cilia whitish; under-side white, no markings.

Expanse of wings $\frac{9}{10}$ inch.

2 ♂, Sierra Leone (*Clements*).

Genus MIXOCERA, Warr., Nov. Zool., viii, p. 206 (1901).

MIXOCERA ALBIMARGO.

Mixocera albimargo, Warr., l. c.

3 ♂, Accra.

The type, a male from Ogruga, River Niger, is in coll. Rothschild.

Genus EUCROSTES, Hübn., Verz., p. 283 (1818).

EUCROSTES RUBRIDISCA.

Eucrostes rubridisca, Warr., Nov. Zool., iv, p. 38 (1897).

1 ♂, Tonga, Brit. E. Africa. 1 ♂, Old Calabar.

The type, a male from Dar-es-Salaam in German E. Africa, is in coll. Rothschild.

EUCROSTES IMPUNCTATA.

Eucrostes impunctata, Warr., Nov. Zool., iv, p. 211, pl. 5, f. 15 (1897).

1 ♂, Sierra Leone.

The type, a male from Mombasa, is in coll. Rothschild; there is also a male from Mashonaland in the B. M.

EUCROSTES BEATIFICATA.

Geometra beatificata, Walker, xxvi, 1554 (1862).

1 ♂, Sierra Leone (type).

Genus Probolosceles, Warr., Nov. Zool., iii, p. 368 (1896).

Probolosceles leucospilata.

Geometra leucospilata, Walker, xxvi, 1554 (1862).

1 ♂, Portuguese E. Africa. 1 ♀, Teita, E. Africa.
The type, a male in the B. M., is from Natal.

Probolosceles punctaria, nov.

♂. Shaft of antennæ and palpi above chocolate-brown, palpi below and frons pure white, plumes of antennæ and collar ochreous-grey, abdomen white, thorax and wings green, head green with a white stripe on each side; costa of fore-wings white; two transverse lines in rows composed of a white dot on each vein, ante- and post-medial; a white dot ringed with chocolate-brown at the end of each cell; marginal line chocolate-brown, interrupted by white dots on each vein, cilia chocolate-brown; under-side pale green, no dots; a brown spot at the end of the cell of the fore-wings, a medial grey transverse sinuous line on both wings; body and legs white.

Expanse of wings $\frac{8}{10}$ inch.

4 ♂, Madagascar (*Cowan*).

Genus Rhomborista, Warr., Nov. Zool., iv, p. 44 (1897).

Rhomborista palliata.

Rhomborista palliata, Warr., l. c., v, p. 16, ♀ (1898).
„ „ Warr., l. c., viii, p. 208 (1901).
Rhomborista ustipennis, Warr., l. c., v, p. 236, ♂.

1 ♀, Old Calabar.
The types from Warri are in coll. Rothschild.

Genus Phorodesma, Boisd., Ind. Méth., p. 179 (1840).

Phorodesma alboviridata.

Comibæna alboviridata, Saalm., Ber. Senck., Ges., 1880, p. 292, ♀.
Phorodesma alboviridata, Saalm., Lep. Madag., p. 495, pl. 14, f. 271 (1884).

2 ♂, Accra.
There are examples in the Tring Museum from German E. Africa and from Angola. The type from Madagascar is in the Frankfort Mus.

PHORODESMA TRIANGULARIA, nov.

♂. Antennæ, head, and body pale sordid ochreous-grey; wings grass-green, the borders sordid ochreous-grey; the border is broad along the costa of fore-wings and broader still on the outer margin of both wings, leaving the green part on the two wings in the form of a triangle. The outer edging of the green part is brown and is slightly undulating, the marginal line of both wings is also brown, and there are indications of two brown bands within the marginal band; the under-side is whitish-ochreous; on the fore-wings is a subcostal brown streak, and on both wings a duplicate outer brown band, rather close to the margin.

Expanse of wings $\frac{9}{10}$ inch.

Madagascar (*Cowan*).

Genus VICTORIA, Warr., Nov. Zool., iv, p. 46 (1897).

Archichlora, Warr., l. c., v, p. 11 (1898).
Chloroteras, Warr., l. c., viii, p. 8 (1901).

VICTORIA VIRIDIMACULA.

Archichlora viridimacula, Warr., l. c., p. 12.

1 ♂, Old Calabar. 1 ♀, Pt. Lokko, Sierra Leone.

The type, a female from Warri, is in coll. Rothschild.

The first two genera were erected on female types.

There is a printer's error in the description of *Victoria* "hind margin elbowed at vein 4"—it should be at 4 and 6.

VICTORIA PULVERIPLAGA.

Oospila pulveriplaga, Warr., Nov. Zool., v, p. 14 (1898).

1 ♀, Old Calabar.

The type, a female from Warri, is in coll. Rothschild.

VICTORIA MARGINATA.

Victoria marginata, Warr., Nov. Zool., ix, p. 497 (1902).

1 ♀, Sapele, River Niger.

The type, a female from Oguta, Niger, is in coll. Rothschild.

VICTORIA DEVOLUTA.

Comibæna devoluta, Walker, xxii, 572 (1861).
Chloroteras devoluta, Warr., Nov. Zool., viii, p. 8 (1901).

1 ♀, Old Calabar.

The type from W. Africa is in the Mus. Oxon.; the type specimen is a male, not female as stated by Walker; it is the type of the genus.

Genus Chlorodrepana, Warr., Nov. Zool., vi, p. 22 (1899).

Chlorodrepana angustimargo.

Chlorodrepana angustimargo, Warr., l. c., viii, p. 7 (1901).

1 ♀, Sierra Leone.

The type, a female from the same locality, is in coll. Rothschild.

Genus Omphacodes, Warr., Nov. Zool., i, p. 396 (1894).

Omphacodes anomala.

Omphacodes (?) *anomala*, Warr., l. c., ix., p. 495 (1902).

1 ♀, Machakos.

The type, a female from the Escarpment, is in coll. Rothschild.

Omphacodes dichroma.

Sterrha dichroma, Felder, Reise, Nov. Lep., pl. 127, f. 20 (1874).

1 ♂, Kitwi, Kangonde, Brit. E. Africa (*Crawshay*).

The type, a male from Plettenburg Bay, is in coll. Rothschild: Felder's figure gives a white cell spot, which this insect has not got, but otherwise it is identical.

Family STERRHINÆ.

Genus Lycauges, Butler, Ann. Mag. N. H. (5), iv, p. 373 (1879).

Lycauges dapharia, nov.

♂, ♀. Antennæ, palpi, head, body and fore-wings dark pinkish-grey; hind-wings whitish, pale pinkish-grey towards the outer border; a black dot at the end of each cell; fore-wings with outwardly oblique and crenulate blackish lines, the first from the hinder margin at one-third to the middle of the cell, the second from the hinder margin at two-thirds to near the apex; the first is pale, the second is dark and is the inner limit of a narrow grey band; between these two lines is an indistinct similar grey thin band, which in

some specimens runs to costa near apex ; there is also a submarginal indistinct similar band and marginal black points ; hind-wings with a blackish crenulate thin band across the disc ; under-side whitish, suffused with pinkish in parts, the cell dots and discal bands prominent.

Expanse of wings $\frac{9}{10}$ inch.

4 ♂, 4 ♀, Machakos (*Crawshay*), including the types. 1 ♂, Kikuyu. 1 ♀, Gwelil. 1 ♀, Eb Urru. 1 ♀, Naitolia.

LYCAUGES SEVANDARIA, nov.

♀. Pale ochreous-grey, sparsely irrorated with rather large blackish-brown atoms ; a black dot at the end of each cell ; fore-wings with an indistinct outwardly curved grey inner line, both wings with an oblique medial grey line, also a similar discal line, rather close together, both running straight from the abdominal margin of the hind-wings and almost meeting on the costa before the apex ; another submarginal sinuous line and marginal black lunules ; under-side whitish, with the markings as above, but indistinct.

Expanse of wings $\frac{8}{10}$ inch.

Hab. E. Quaso, Masai, Brit. E. Africa (*Betton*).

LYCAUGES ERINARIA, nov.

♀. Frons and palpi at the tips blackish-brown ; head, body, and wings whitish-grey, irrorated with blackish-brown atoms, collar blackish-brown ; some marks of that colour on the thorax and on the abdomen, forming segmental bands ; indications of an outwardly curved, grey, inner line on the fore-wings ; both wings with a greyish-brown, nearly straight central band from the abdominal margin of the hind-wings to costa of fore-wings before the apex, single on the hind-wings, double on the fore-wings, with a black crenulate line running inside the double band ; the space between this central band and the outer margin filled in with three indistinct, sinuous grey bands ; marginal lunules blackish-brown ; under-side paler, markings as above.

Expanse of wings $\frac{9}{10}$ inch.

Hab. KIKUYU, Machakos to Neugia (*Crawshay*).

LYCAUGES COMMARIA, nov.

♀. Pale ochreous-grey ; frons brown, abdomen with brown bands ; fore-wings and lower portion of hind-wings irrorated with blackish-brown atoms ; a black dot at the end of each cell ; fore-wings with a blackish band from middle of hinder margin to costa near apex, a

submarginal grey sinuous line, a duplicate grey sinuous line between them; hind-wings with a thin crenulate grey short band from the middle of the abdominal margin to the cell dot and three similar short bands at even distances apart between this and the outer margin; the upper half of the wing white without irrorations or markings; under-side mostly pure white, markings as above.

Expanse of wings $\frac{9}{10}$ inch.

2 ♀, mile 478, Uganda Railway (*Betton*).

Genus Emmiltis, Hübn., Verz., p. 309 (1818).
„ Warr., Nov. Zool., viii, p. 23 (1902).
Craspedia, Hübn., l. c., p. 312.
Trichoclada, Meyrick, Trans. Ent. Soc., 1886, p. 208.
Runeca, Moore, Lep. Atk., p. 252 (1888).

Emmiltis internataria.

Acidalia internataria, Walker, xxii, 746 (1861).

1 ♀, Congo (type). 1 ♂, Teita, Brit. E. Africa. 1 ♀, Muthambi, Brit. E. Africa.

Emmiltis lactaria.

Acidalia lactaria, Walker, xxii, 744 (1861).
Acidalia intervulsata, Walker, xxii, 745.
Acidalia tectaria, Walker, xxxv, 1619 (1866).

2 ♂, 3 ♀, Sierra Leone, including both types. 1 ♂, Massowah. 1 ♂, Abyssinia. 4 ♂, 1 ♀, Old Calabar.

In vol. xxxv Walker renamed his *lactaria*.

Emmiltis fumosaria, nov.

♂, ♀. Palpi, frons, and head blackish-brown, space between the antennæ pure white; body and wings grey, with a slight pinkish-ochreous tinge, abdomen with grey bands; wings covered with minute brown irrorations; a brown dot at the end of each cell; all the bands and lines grey and oblique; on the fore-wings there is an inner straight line, on both wings a central band, from the middle of the abdominal margin of hind-wings to the costa before apex of fore-wings, where it is bent slightly round inwards; this band is really a duplex line with the inner part filled in with grey; between this and the outer margin there are two crenulate lines on the fore-wings and three on the hind-wings; submarginal grey points, and marginal brown points, and marginal grey line; under-side much as above, but paler.

Expanse of wings 1 inch.

2 ♂, Kikuyu, Nairobi Plains (type) (*Crawshay*). 2 ♂, Eb Urru (*Betton*). 1 ♂, Nairobi, Machakos (*Betton*). 1 ♂, Nairowa (*Betton*). 1 ♀, Ndabibi (*Betton*) (type).

The type ♀ is in rather poor condition and has lost its abdomen; it is a little darker than the males, but is otherwise not different.

EMMILTIS INSCRIPTATA.

Acidalia inscriptata, Walker, xxvi, 1605 (1862).
Craspedia nigrinotata, Warr., Nov. Zool., iv, p. 52 (1897).

3 ♂, Sierra Leone. 1 ♂, Old Calabar.

The type from S. Africa is in this Museum, Warren's types from Zomba are in coll. Rothschild.

EMMILTIS CONSENTANEA.

Acidalia consentanea, Walker, xxii, 745 (1861).
Acidalia derasata, Walker, xxvi, 1604 (1862).

6 ♂, Machakos, Brit. E. Africa. 1 ♂, Nairowa, Brit. E. Africa. 1 ♂, Teita, Brit. E. Africa. 1 ♂, 1 ♀, Kikuyu, Brit. E. Africa. 1 ♂, Appan, Gold Coast. 1 ♂, Old Calabar. 2 ♂, 1 ♀, Sierra Leone.

The types from the Cape are in this Museum, as are also several examples from Natal and Cape Colony.

EMMILTIS OSSICOLOR.

Craspedia ossicolor, Warr., Nov. Zool., iv, p. 218 (1897).
Craspedia (?) *submarginata*, Warr., l. c., v, p. 241 (1898).

1 ♂, Old Calabar. 5 ♂, 1 ♀, Sierra Leone. 1 ♀, Sapele, River Niger.

The type, a male from Sierra Leone, and the type of *submarginata*, a female from Warri, are in coll. Rothschild.

EMMILTIS FIBULATA.

Acidalia fibulata, Guen., Phal., i, p. 490, pl. 15, f. 5 (1857).
Craspedia fibulata, Hmpsn., Moths Ind., iii, p. 432 (1895).

4 ♂, Eb Urru, Brit. E. Africa. 1 ♂, El Burgon, mile 478, Uganda Railway.

There are two examples from S. Africa in the B. M., it is a common insect all over the Eastern world, and has been described under many names.

Emmiltis sinnaria, nov.

♂, ♀. Greyish-white, irrorated with grey atoms; space between the antennæ pure white; abdomen with greyish-brown segmental bands; wings with the lines greyish-brown and undulating; fore-wings with three transverse lines, the first inner, incomplete, followed by a grey lunule at the end of the cell, the second medial, third discal; hind-wings with two, the first before the middle, the other discal; both wings with a marginal white line containing black lunules; cilia with grey patches and white tips; under-side whitish, with cell spots and markings as above.

Expanse of wings $\frac{9}{10}$ inch.

2 ♂, 1 ♀, Machakos (*Crawshay*).

Emmiltis caducaria, nov.

♂, ♀. White with ochreous-grey bands and markings and a few black irrorations; upper-side of palpi and frons brown, head black; fore-wings with an indistinct stripe on the costal margin, and both wings with indistinct transverse bands, medial and discal, rather broad and undulating; a similarly coloured very indistinct marginal band; a black dot at the end of each cell and marginal black points; under-side whitish with the markings mostly obliterated.

Expanse of wings 1 inch.

1 ♂, East Quaso (*Betton*) (type). 1 ♀, mile 478, Uganda Railway (*Betton*) (type). 1 ♀, East Quaso (*Betton*).

Emmiltis vitiosaria, nov.

♂, ♀. Outer sides of palpi and frons blackish-brown, top of head pure white with a brown band behind; body and wings dull ochreous-white; some dull ochreous suffused marks indicating antemedial, medial, and discal bands, but the indications are very faint; a black dot at the end of the cell of hind-wing, and black points in the outer margin of both wings; under-side dull white without markings; fore-legs striped with black on the upper-sides.

Expanse of wings ♂ $1\frac{8}{10}$, ♀ $1\frac{4}{10}$ inches.

2 ♂, 1 ♀, E. Quaso, Masai (*Betton*).

Emmiltis peararia, nov.

♂. Palpi, frons, and head brown, space between the antennæ pure white; body and wings pale ochreous-grey, irrorated with very minute grey atoms; inner transverse line of fore-wings not visible; both wings crossed by medial and discal grey thin bands, slightly

crenulated but straight and parallel on fore-wings, corresponding to the shape of the outer margin on the hind-wings; between the outer band and the margin there are indications of two other similar bands; a black dot at the end of each cell, and black dots on the outer margin; under-side paler, the two transverse bands distinct.

Expanse of wings $\frac{9}{10}$ inch.

2 ♂, mile 478, Uganda Railway (*Betton*).

EMMILTIS ROEZARIA, nov.

♀. Frons and palpi chestnut-red, top of head white with a chestnut band behind; body and wings white; costal line of fore-wings chestnut-red; a speck at the end of each cell and indications of a middle line, which is more apparent on the hind-wings; a dentated grey discal line with black points across both wings, an indistinct submarginal line and black marginal points; under-side of wings white; fore-wings with the costal line red, some red suffusion on the costal space, discal line red, and marginal line of both wings red.

Expanse of wings $\frac{8}{10}$ inch.

Madagascar (*Wills*).

EMMILTIS OPICATA.

Phalæna opicata, Fabr., Ent. Syst. Suppl., p. 457 (1794).
Pigia infantularia, Guen., Phal., ii, p. 20 (1857).
Micronia vanaria, Walker, xxiii, 820 (1861).

1 ♂, Chinde to Mandala, Brit. Central Africa (*de Jersey*).

The type from East Indies is in the Banksian cabinet; Guenée's type, a female, came from Ceylon. There are many examples from Ceylon and S. India in the B. M. which are indistinguishable from this Central African specimen.

EMMILTIS DISSONANS.

Craspedia dissonans, Warr., Nov. Zool., iv, 51 (1897).

1 ♀, Machakos, Brit. E. Africa. 1 ♀, Eb Urru, Brit. E. Africa.

The types from Natal are in coll. Rothschild.

EMMILTIS BONAVENTURA.

Craspedia bonaventura, Warr., Nov. Zool., iv, p. 50 (1897).

1 ♂, Abyssinia.

The types from Natal are in coll. Rothschild.

Emmiltis internata.

Acidalia internata, Guen., Phal., i, p. 506 (1857).
Acidalia strigulifera, Walker, xxii, 743 (1861).
Acidalia illiturata, Walker, xxvi, 1602 (1862), nec, p. 1755.
Craspedia fimbrilineata, Warr., l. c., ix, 499 (1902).

1 ♂, Nyassaland.

Walker's types from Natal and Krysna are in this Museum; Warren's type, a male from the Escarpment, Brit. E. Africa, is in coll. Rothschild; the species varies much in size, but I cannot find any other character by which to separate the different names.

Emmiltis cassiaria, nov.

♀. Palpi, frons, and head black, frons with some white marks; body and wings dark grey with a pinkish tinge, smeared with sordid grey and irrorated with brown atoms; fore-wings with three brown spots on the costa indicating the commencement of transverse bands; all the bands and markings blackish-brown, the inner band visible only on the fore-wings; both wings with medial and discal bands, the first with a red suffusion on its outer side, the other, double in parts, pointed with black dots, and with a blackish square patch above the middle on the fore-wings and on the hinder borders of both wings; a black dot at the end of each cell; a brown marginal band, marginal black spots, and black spots on the cilia; under-side paler and more white, with the bands and markings more or less as above and more prominent.

Expanse of wings $1\frac{1}{10}$ inches.

3 ♀, E. Quaso, Masai (*Betton*).

Emmiltis (?) minorata.

Geometra minorata, Boisd., Faun. Madag., p. 115 (1834).
Acidalia mauritiata, Guen., Phal., i, p. 476 (1857).

1 ♂, Old Calabar.

The type came from the Mauritius; it is a widely-spread insect; there are examples in the Tring Museum, from several localities; it is difficult to know where to put it, as it is not a typical Emmiltis, having normal legs and a pencil of hairs from the femoro-tibial joint, as long as the tibia itself.

Genus Ptychopoda, Steph., Ill. Brit. Ent. Haust., iii, p. 305 (1829).

Ptychopoda submaculata.

Ptychopoda submaculata, Warr., Nov. Zool., v, p. 243 (1898).

2 ♂, 2 ♀, Sierra Leone.
The type, a female from Warri, is in coll. Rothschild.

Ptychopoda minimaria.

Ptychopoda minimaria, Warr., Nov. Zool., xi, p. 468 (1904).

2 ♂, 1 ♀, Tana River, Brit. E. Africa.
The type, a male from Mombasa, is in coll. Rothschild.

Ptychopoda lalasaria, nov.

♂. Grey; the ground-colour is ochreous-white, but the greyish-brown irrorations are so dense as to make it look grey; lines brownish; the interior line faintly visible on the fore-wings, both wings with two post-medial lines, rather close together, leaving a whitish space between them; beyond the outer of these two lines is a thin undulating line very close to it; a marginal line; a black dot at the end of each cell; cilia white with small brown patches; under-side whitish; fore-wings irrorated with brown atoms, hind-wings without irrorations, the discal bands distinct.

Expanse of wings $\frac{6}{10}$ inch.

Machakos (*Crawshay*).

Ptychopoda fylloidaria, nov.

♂, ♀. Ochreous-fawn colour, irrorated with brown atoms; costa of fore-wings with two brown spots, indicating ante-medial and post-medial lines; a straight brown thick line from the middle of the hinder margin to near the apex, being the inner edging of a broad wedge-shaped band; a broad submarginal pale band on both wings; a black dot at the end of each cell in the female, obsolete in the male; hind-wings pale ochreous-grey, with the lower part suffused with brown; under-side paler, a blackish streak in the cell of fore-wings and a similar discal transverse band.

Expanse of wings $\frac{7}{10}$ inch.

1 ♂, Nairowa (*Betton*) (type). 1 ♀, Machakos to Neugia (*Crawshay*) (type). 1 ♀, Kibanni (*Crawshay*). 1 ♀, Athi Valley (*Crawshay*). 1 ♀, Kikuyu (*Crawshay*).

Ptychopoda macrostyla.

Eois macrostyla, Warr., Nov. Zool., vii, p. 92 (1900).

3 ♂, Tonga, Brit. E. Africa. 2 ♂, Sierra Leone.

The type, a male from Ikutha, Brit. E. Africa, is in coll. Rothschild.

Genus Phyletis, Guen., Phal., ii, p. 169 (1857).

Phyletis silonaria.

Phyletis silonaria, Guen., l. c.
Phyletis sticticata, Warr., Nov. Zool., viii, p. 10 (1901).

3 ♂, Machakos. 1 ♂, Kikuyu.

Guenée's type, a male from Abyssinia (the type of the Genus), is in the Paris Mus.; Warren's type, a male from Uganda, is in coll. Rothschild; veins 6 and 7 of the hind-wings are from the cell in this Genus and not on a stalk as in *Rhodostrophia*.

Genus Perixera, Meyrick, Trans. Ent. Soc., 1886, p. 209.

Perixera sublunata, nov.

♂. Shaft of the antennæ, the space between them, the frons, and lower side of palpi white; branches of the antennæ blackish; upper-side of palpi chestnut-brown; body and wings pale pinkish-grey; both wings with a transverse discal row of black dots, the fourth and seventh counting from the costa on both wings farther inside than the others; a marginal row of black dots between the veins, a well-shaped white lunule at the end of each cell; under-side pinkish-white, dots as above, but no lunules.

Expanse of wings $1\frac{3}{10}$ inches.

Aburi (*Carter*).

Has apparently lost the tuft of hairs on the hind-legs, but has only two terminal spurs.

Genus Induna, Warr., Nov. Zool., iv, p. 55 (1897).

Induna exiguaria.

Boarmia exiguaria, Walker, xxi, 368 (1860).
Induna rufisalsa, Warr., l. c.

4 ♂, 1 ♀, Machakos, Brit. E. Africa.

The type in the B. M. is a female without antennæ from South Africa; there are also several examples of both sexes

from Zululand and Natal; Warren's types from Natal are in coll. Rothschild.

Genus Cosymbia, Hübn., Verz., p. 302 (1818).

Leucophthalmia, Hübn., l. c.
Ephyra, Dup., Lep. France, iv, p. 102 (1829).

Cosymbia rufistrigata.

Ephyra rufistrigata, Hmpsn., P. Z. S., 1896, p. 267, pl. 10, f. 3.

2 ♂, Teuta, E. Africa.
The types from Aden are in the B. M.

Cosymbia anandaria, nov.

♂. Ochreous-grey with a slight pinkish tinge; plumes of antennæ pale black; wings irrorated and striated with brown; fore-wings with a duplex discal thin band from the hinder margin beyond the middle meeting together at vein 6 and then as a single thin band to the apex; hind-wings with two indistinct and incomplete similar bands, before and beyond the middle; under-side coloured as above but with some pink suffusions; both wings crossed by a discal thin band.
Expanse of wings 1 inch.

1 ♂, Machakos (*Crawshay*) (type). 1 ♂, Kilimanjaro.

Cosymbia (?) testaceata.

Ephyra testaceata, Walker, xxvi, 1575 (1862).

1 ♂, Congo (type).
The example is a mere fragment, with torn wings, without antennæ or abdomen, and I doubt if anything will ever be identified from it.

Genus Pisoraca, Walker, xxiv, 1078 (1862).

Pisoraca leonaria.

Ephyra (?) *leonaria*, Walker, xxii, 635 (1861).
Ephyra lutearia, Dewitz, Verh. Leop.-Carol. Akad., xlii, p. 84, pl. 3, f. 21 (1881).

1 ♂, Sierra Leone (type). 3 ♂, 1 ♀, Old Calabar. 1 ♀, Sapele, River Niger.
Not a typical *Pisoraea*, the inner medial spur being present on the hind tibiæ of the male; in every other respect it corresponds to Hampson's diagnosis of the genus *Pisoraca*.

Dewitz's type, a female from Lagos, corresponds to the female from Sapele.

Genus Traminda, Von Heyd., Ber. S. G., 1880, pl. 14, f. 262.

Traminda, Warr., Nov. Zool., ii, p. 100 (1895).

Traminda nigripuncta.

Traminda nigripuncta, Warr., Nov. Zool., iv, p. 225 (1897).

3 ♂, Abyssinia.
The type, a female from Liberia, is in coll. Rothschild.

Traminda neptunaria.

Timandra neptunaria, Guen., Phal., ii, p. 3, pl. 18, f. 5 (1857).
Timandra viridaria, Walker, xxiii, 800 (1861).

The type from Abyssinia is in the Paris Museum; Walker's type and several other examples are in the B. M.; I have it in my own collection from Dar-es-Salaam in German E. Africa.

Traminda variegata, nov.

♂, ♀. Palpi and upper-side of fore-legs pink, all the legs in some examples striped with pink; body and wings varying in colour from dull green to pinkish-grey; a black dot at the end of cell of fore-wings, a white dot at the end of the cell of hind-wings, the former with a white speck, the latter with a black one; a brown medial transverse thin band, outwardly edged with whitish, from the middle of the abdominal margin to the costa of fore-wings near the apex; both wings also with a uniform transverse row of discal dots; under-side whitish much suffused with pink, without any markings.

Expanse of wings $1\frac{1}{16}$ inches.

♂, ♀, Machakos (*Crawshay*) (types). 1 ♂, Nairowa. 1 ♂, Takaunga. 1 ♀, Tonga.

Genus Chrysocraspeda, Hmpsn., Moths Ind., iii, p. 443 (1895).

Chrysocraspeda latiflavaria, nov.

♀. Antennæ, palpi, head, body, and wings dark pinkish-red, tip of abdomen yellow; outer borders of both wings broadly yellow, quite one-third of the lower part of the fore-wings and throughout the

hind-wings, the red portion limited by a thick dark red line which commences at costa of fore-wings near the apex, to near the middle of the outer margin, then runs inward to the lower end of the cell and downwards to hinder margin a little beyond the middle, then continued on the hind-wings, being bent outwards at its middle; there are some yellow marks within the red, towards the apex; under-side as above but paler; body and legs yellow.

Expanse of wings $\frac{8}{10}$ inch.

Hab. Likoma, Nyassaland (*E. M. de Jersey*).

Chrysocraspeda zearia, nov.

♀. Antennæ, frons, and palpi pale purplish-ochreous, also the body and legs beneath; head and body above dark red-brown, with a strong tinge of pink; fore-wings with the base half and the whole of the hind-wings of the same colour; this colour on the fore-wings is limited by an oblique orange edging which extends from the costa near the middle to the hinder angle; the space beyond is yellow suffused with orange, leaving a yellow oblique band next to the orange edging, and a large sub-apical patch of the same colour as the base of the wing; hind-wing with a black lunule at the end of the cell; cilia of both wings broad and yellow with an inside edging of dark orange; under-side of both wings uniformly pale greyish-pink, with the yellow oblique band of the fore-wings, and yellow cilia to both wings.

Expanse of wings 1 inch.

2 ♀, Madagascar (*Cowan*).

Chrysocraspeda doricaria, nov.

♀. Antennæ yellow, palpi and frons pink, head and body brownish-ochreous; wings yellow with many dark pinkish and brownish-ochreous marks and small patches, most frequent along costal and hinder marginal spaces, and also some forming discal and marginal bands rather close together, and joined in the middle by a bar; a black dot at the end of the cell; hind-wings similarly marked but having the inner portions more yellow; two black dots at the end of the cell; the discal and marginal bands more disjointed; a large blackish-brown patch on the middle of the abdominal margin, and a corresponding patch on the middle of the abdomen; under-side yellow with a few pinkish-grey marks on the costal space of the fore-wings.

Expanse of wings $\frac{9}{10}$ inch.

2 ♀, Madagascar (*Cowan*).

CHRYSOCRASPEDA PLANARIA, nov.

♀. Antennæ yellow; palpi, head, body, and wings dull pale purplish-chocolate colour, very uniform throughout; hinder marginal line of fore-wings white; cilia of both wings bright yellow with white tips; a very small white dot with a black point at the end of each cell, no other markings above or below; under-side paler, cilia white.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. MADAGASCAR (*Cowan*).

Genus PROBLEPSIS, Led., Verh. zool.-bot. Ges., Wien, 1852, Abh., p. 74 (1853).

PROBLEPSIS ÆGRETTA.

Problepsis ægretta, Felder, Reise, Nov. Lep., pl. 128, f. 14 (1876).
Argyris latonaria, var. Walker, xxiii, 807 (1861).
Problepsis diyammata, Warr., Nov. Zool., iv, p. 59 (1897).

1 ♂, E. Quaso, Masai, Brit. E. Africa. 1 ♀, Mt. Molo, mile 480, Uganda Railway.

Both types from S. Africa are in coll. Rothschild, and there are three examples from Natal in the B. M.

PROBLEPSIS VESTALIS.

Argyris vestalis, Butler, Ann. Mag. N. H. (4), xvi, p. 419 (1875).

2 ♀, Eb Urru, Brit. E. Africa.

Butler's type, a male from Natal, is in this Museum, as also are several other examples from South Africa; this insect has heretofore stood in collections as *pythiaria*, Guen., the type of which came from Abyssinia, and is very different.

PROBLEPSIS FLAVISTIGMA, nov.

♂. Palpi black above, antennæ ochreous, head, body, and wings white; a somewhat ear-shaped ocellus at the end of each cell, ringed with raised silvery scales; on the fore-wing the upper half of the ocellus is ringed with black, with only a few silvery scales on that colour; a discal ochreous-grey transverse line on both wings; a sub-marginal macular line, the spots on the hind-wings the most

prominent; under-side pure white without markings; legs striped with ochreous.

Expanse of wings 1½ inches.

1 ♂, Free Town, Sierra Leone (type) (*Carter*). 1 ♂, Nairobi Forest, Brit. E. Africa (*Crawshay*).

Genus SOMATINA, Guen., Phal., ii, p. 10 (1857).

Nebessa, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 375 (1868).

SOMATINA CHALYBEATA.

Nebessa chalybeata, Walker, Proc. N. H. Soc. Glasg., 1 (ii), p. 376 (1869).

1 ♂, Congo (type). 1 ♂, Accra.

SOMATINA ACCRARIA, nov.

♀. Palpi brown above, frons white, top of head brown, space between the antennæ pure white; body and wings greyish-white, the outer borders suffused with grey; both wings crossed by two rather zigzag and dentated grey lines, post-medial and discal, rather close together and not very distinct; marginal line brown, with elongate indistinct lunules; costal line of fore-wings ochreous; under-side pure white, without markings; legs slightly ochreous.

Expanse of wings 1$\frac{5}{16}$ inches.

Hab. ACCRA (*Carter*).

Family LARENTIINÆ.

Genus PSEUDOSTERRHA, Warr., P. Z. S., 1888, p. 324.

Rhodometra, Meyrick, Trans. Ent. Soc., 1892, p. 75.

PSEUDOSTERRHA INTERVENATA.

Rhodometra intervenata, Warr., Nov. Zool., ix, p. 506 (1892).

1 ♂, 1 ♀, Kikuyu. 3 ♂, Machakos. 1 ♂, Munisu, Brit. E. Africa. 1 ♂, Eb Urru, Brit. E. Africa. 1 ♂, 2 ♀, Abyssinia.

The types from the Escarpment are in coll. Rothschild; the Abyssinian examples are larger than the others, and the bands duller in colour.

Pseudosterrha sacraria.

Phalæna (Geometra) sacraria, Linn., Syst. Nat., i. (2), 863, 220 (1759).

2 ♂, 2 ♀, Eb Urru, Brit. E. Africa. 1 ♀, Port Ugowe (*H. H. Johnston*). 1 ♀, Munisu. 1 ♂, Kikuyu.

Pseudosterrha lucidaria, nov.

♂, ♀. Antennæ of male with a black shaft and pale ochreous-brown pectinations, of the female ochreous; palpi brown; head and fore-wings yellow; pectus, frons, collar, costa of fore-wings, cilia, cell spot, a straight band from apex to vein 1a, above the middle of the hinder margin, and then along the vein to near the base, bright pink; in the female these colours are dull and paler, and the wing is more or less suffused with dull pale pink, leaving the veins and hinder margin yellow; hind-wings and abdomen white, slightly tinged with yellow; under-side whitish, costa and cilia bright pink, discal band brown.

Expanse of wings 1½ inches.

1 ♂, 3 ♀, Machakos (*Crawshay*).

Genus Philereme, Hübn., Verz., p. 331 (1818).

Scotosia, Steph., Ill. Brit. Ent. Haust., iii, p. 259 (1829).

Philereme rubritincta.

Scotosia rubritincta, Hmpsn., Bull. Liverp. Mus., ii, p. 38 (1899).

2 ♀, Munisu, Brit. E. Africa. 1 ♂, Eb Urru. 3 ♂, 4 ♀, Sokotra, including the type.

Genus Plerocymia, Hübn., Verz., p. 329 (1818).

Plerocymia monosticta.

Ortholitha monosticta, Butler, P. Z. S., 1894, p. 592, pl. 37, f. 9.

Plerocymia nigrocellata, Warr., Nov. Zool., iv, p. 236, pl. 5, f. 6 (1897).

4 ♂, Brit. E. Africa (*Gregory*), including the type. 2 ♂, 5 ♀, Kikuyu, Machakos to Neugia. 2 ♀, Ngong, Machakos to Neugia. 1 ♂, Eb Urru. 2 ♂, Abyssinia.

Warren's types from Nandi, Uganda Protectorate, are in coll. Rothschild.

Plerocymia megalaria.

Eubolia megalaria, Guen., Phal., ii, p. 489 (1857).
Eubolia atroclarata, Walker, xxvi, 1737 (1862).
Eubolia atrosigillata, Walker, xxvi, 1739.

1 ♂, Lagari, Brit. E. Africa. 1 ♂, Ndimu, mile 469, Uganda Railway. 1 ♀, Machakos.

Walker's types from South Africa are in this collection; Guenée's type came from Caffraria.

Plerocymia multilinearia, nov.

♂, ♀. Antennæ, palpi, frons, and head ochreous-brown, body ochreous-grey; fore-wings with the ground-colour white, crossed by four straight bands composed of brown lines, the second band with the inner line thick, the others with the outer band thick, the three first bands with an interior indistinct line; marginal line brown, cilia grey; hind-wings ochreous-grey, without markings: under-side pinkish-white with some of the lines on the fore-wings visible, and a discal outwardly bent pinkish-grey line across the hind-wings.

Expanse of wings 1 inch.

Hab. Eb Urru, Brit. E. Africa (*Betton*).

Allied to *P. albiclausa*, Warren, from Natal, Nov. Zool., iv, p. 236, but that insect has the fore-wings of a dark fawn-colour, the first two bands obliterated, hind-wings white, but the bands visible are somewhat similar.

Plerocymia dulcis.

Eubolia dulcis, Butler, Ann. Mag. N. H. (5), iv, p. 245 (1879).

1 ♂, Madagascar (type).

Genus Gonanticlea, Swinhoe, Trans. Ent. Soc., 1892, p. 3.

Gonanticlea obtusa.

Gonanticlea obtusa, Warr., Nov. Zool., ix, p. 517 (1902).

2 ♂, 2 ♀, Kukuyu, Brit. East Africa. 2 ♂, El Burgon, mile 478, Uganda Railway. 1 ♂, Ndimu, mile 469, Uganda Railway.

Warren's types from the Escarpment are in coll. Rothschild.

Gonanticlea meridionata.

Cidaria meridionata, Walker, xxv, 1399 (1862).

1 ♀, Eb Urru, Brit. E. Africa. 1 ♀, Lavi, Brit. E. Africa. 2 ♀, E. Quaso, Masai, Brit. E. Africa. 1 ♂, Ndimu, mile 469, Uganda Railway. 1 ♀, Kikuyu.

The type, a female from S. Africa, is in the National Collection; it is very faded and worn, and has lost its abdomen, but the markings are distinguishable; the insect is very variable, but the markings can be traced through all the variations.

Genus Cosmorhoë, Hübn., Verz., p. 326 (1818).

Cosmorhoë argyridia.

Cataclysme argyridia, Butler, P. Z. S., 1894, p. 592, pl. 37, f. 10.
Eulype (?) *disparata*, Warr., Nov. Zool., iv, p. 234, pl. 5, f. 12 (1897).

1 ♂, 1 ♀, Eb Urru, Brit. E. Africa. 5 ♂, Brit. E. Africa, including the type. 1 ♂, Ngong, Machakos to Neugia. 1 ♂, 1 ♀, Kikuyu. 1 ♂, 1 ♀, El Burgon, mile 478, Uganda Railway.

Warren's types from Uganda are in coll. Rothschild.

Genus Monochyria, Warr., Nov. Zool., viii, p. 128 (1901).

Monochyria poseata.

Amœbe poseata, Hübn., Geyer Samml., Exot., Schmett., v, p. 46, f. 999, 1000 (1815).
Larentia viridicinctata, Guen., Phal., ii, p. 288 (1857).
Cidaria penetrata, Walker, xxv, 1401 (1862).
Cidaria umbriferata, Walker, xxvi, 1732 (1862).
Cosmorhoë submaculata, Warr., Nov. Zool., ix, p. 515 (1902).

2 ♂, Lavi, Brit. E. Africa. 1 ♂, Machakos. 5 ♂, 3 ♀, Kikuyu. 4 ♀, mile 498, Uganda Railway. 1 ♀, Nairowa.

Walker's types are in this Museum from South Africa, where the species seems to be quite common; Warren's type, a male from the Escarpment, is in coll. Rothschild.

This species is superficially not distinguishable from *Polystroma subspissata*, Warr., Nov. Zool., iv, p. 237, but the latter can easily be separated by the male having a tuft of black hair, on the fore-wing below, somewhat as in the genus *Photoscotosia*.

Genus Epirrhoë, Hübn., Verz., p. 328 (1818).

Epirrhoë prasinaria.

Epirrhoë prasinaria, Warr., Nov. Zool., viii, p. 13 (1901).

16 examples, mile 478, Uganda Railway. 1, Kikuyu. 4, E. Quaso, Masai. 1, Ndabibi.

The type, a female from Kilimanjaro, is in coll. Rothschild.

Epirrhoë heliopharia, nov.

♀. Palpi and antennæ blackish-brown, head and thorax pinkish-brown, abdomen pinkish-grey, a pale band at the base, the remaining segments with thin brown bands; fore-wings dark pinkish-grey with three transverse, almost straight bands, sub-basal, ante-medial and medial, each composed of four more or less crenulated dark brown lines; outside these are several more similar but less conspicuous lines, followed by sub-marginal pale lunules, the inner sides of three of them below the apex suffused with black and another small sub-apical patch close to them on the outer margin; hind-wings whitish with the commencement of numerous transverse crenulated brown lines from the abdominal margin, which continue for about one-third of the wing and then become obsolescent; marginal line of both wings brown, cilia pale pinkish, interlined with brown; under-side whitish with the transverse lines more or less visible and complete on the hind-wings.

Expanse of wings $1\frac{3}{16}$ inches.

4 ♀, mile 478, Uganda Railway (*Betton*).

Genus Ochyria, Hübn., Verz., p. 334 (1818).

Ochyria viridata.

Coremia viridata, Walker, xxv, 1310 (1865).
Melanippe colorata, var., Walker, xxvi, 1712 (1866).

1 ♂, mile 498, Uganda Railway. 3 ♂, Machakos.

The type from the Cape is in Mus. Oxon.; there are also some examples in this Museum from Natal.

Ochyria thorenaria, nov.

♀. Frons white; palpi, antennæ, head, thorax, and fore-wings dark pinkish-grey; the ground-colour of the fore-wings is really white, with a dark grey (nearly brown), broad basal band, another similar broad central band, bent outwardly on its inner side, dentated on its outer side, with a large central dentation and a half

dentation on the costa and another on the hinder margin, both bands edged with darker brown; two discal lines close together and the outer margin brownish; outer marginal line with white and brown points; hind-wings pale pinkish, a row of grey sub-marginal spots; under-side of fore-wings pale pinkish with the outer toothed margin of the central band visible; hind-wings darker pinkish with a very dark and prominent, outwardly bent pinkish discal band.

Expanse of wings $\frac{9}{10}$ inch.

Hab. MADAGASCAR (*Wills*).

Genus ASTHENOTRICHA, Warr., Nov. Zool., vi, p. 34 (1899).

ASTHENOTRICHA DENTATISSIMA.

Asthenotricha dentatissima, Warr., l. c.
Asthenotricha serraticornis, Warr., l. c., ix, p. 505 (1902).

3 ♂, Ndimu, mile 469, Uganda Railway. 3 ♂, 2 ♀, mile 478, Uganda Railway. 1 ♂, 2 ♀, Kikuyu, Roromo.

Warren's types, a male from Mpwapwa, German East Africa, and a male from the Escarpment, are in coll. Rothschild.

ASTHENOTRICHA INUTILIS.

Asthenotricha inutilis, Warr., l. c., viii, p. 200 (1901).

1 ♂, Kikuyu, Brit. E. Africa.

The type, a male from Nandi, is in coll. Rothschild.

ASTHENOTRICHA FLAVICOMA.

Asthenotricha flavicoma, Warr., Nov. Zool., vi, p. 296 (1899).

1 ♂, Lugari, Brit. E. Africa. 1 ♂, Kikuyu, Brit. E. Africa. 3 ♀, El Burgon, mile 478, Uganda Railway. 1 ♀, Ndimu, mile 469, Uganda Railway.

Genus TEPHROCLYSTIA, Hübn., Verz., p. 323 (1818).

Eupithecia, Curt., Brit. Ent., vi, p. 64 (1825).

TEPHROCLYSTIA DILUCIDA.

Tephroclystia dilucida, Warr., Nov. Zool., vi, p. 297 (1899).

1 ♂, E. Quaso, Masao.

The type, a female from Nandi Station, is in coll. Rothschild.

TEPHROCLYSTIA NIGRIBASIS.

Tephroclystia nigribasis, Warr., Nov. Zool., ix, p. 511 (1902).
„ „ var. *carnea*, Warr., l. c.

1 ♀, Athi-ya-Mawe, Brit. E. Africa. 1 ♂, Kikuyu, Brit. E. Africa. 1 ♀, Ndimu, mile 469, Uganda Railway. 1 ♀, mile 478, Uganda Railway. 1 ♀, East Quaso, Masai.

Warren's types from the Escarpment are in coll. Rothschild.

TEPHROCLYSTIA REGULOSA.

Tephroclystia regulosa, Warr., Nov. Zool., ix, p. 512 (1902).

2 ♀, Eb Urru, Brit. E. Africa.

The type, a female from the Escarpment, is in coll. Rothschild.

TEPHROCLYSTIA ANGUINATA.

Tephroclystia anguinata, Warr., Nov. Zool., ix, p. 310 (1902).

1 ♂, mile 478, Uganda Railway.

The type, a female from the Escarpment, is in coll. Rothschild.

TEPHROCLYSTIA FUMITACTA.

Tephroclystia fumitacta, Warr., Nov. Zool., x, p. 274 (1903).

3 ♂, mile 478, Uganda Railway.

TEPHROCLYSTIA ORBARIA, nov.

♀. Grey, covered with minute brown irrorations; palpi, frons, head, antennæ, and body brown; fore-wings with a basal brown narrow band, then a broad brown ante-medial band, the two bands separated by a narrow grey space; a short discal band from the costa, a sub-marginal band, thick on the costa, narrowing hindwards; all the bands limited by blackish lines, edged outwardly with whitish, the sub-marginal whitish line more prominent than the others; hind-wings grey, without markings; marginal line of both wings black; cilia ochreous marked with brown; under-side, uniform dull pale grey; two indistinct ochreous square patches on costa of fore-wings, beyond the middle, indications of medial and discal curved thin grey bands on both wings.

Expanse of wings $\frac{8}{10}$ inch.

2 ♀, Eb Urru (type) (*Betton*). 1 ♀, mile 478, Uganda Railway (*Betton*).

Tephroclystia mendosaria, nov.

♂. Wings long and narrow; fore-wings with the outer margin nearly two-thirds the length of the costa; apex rounded; colour pinkish-grey, irrorated with minute brown atoms; palpi, antennæ, head, body, and fore-wings dark pinkish-grey; costal line with some minute brown marks; a brown dot at the end of the cell; a brown marginal line divided by the veins; cilia pale grey with two brown interlines; hind-wings pale grey, the commencement of some brown bands at the abdominal margin; marginal line and cilia as in fore-wings; under-side pale grey, fore-wings with the cell dot and with indications of a discal thin band; hind-wings crossed by seven or eight indistinct grey bands; legs with brown stripes above.

Expanse of wings $\frac{8}{10}$ inch.

2 ♂, Machakos (*Crawshay*).

Tephroclystia picturata.

Tephroclystia picturata, Warr., Nov. Zool., ix, p. 511 (1902).

1 ♀, mile 478, Uganda Railway.

The type, a female from the Escarpment, is in coll. Rothschild.

Tephroclystia vermiculata.

Tephroclystia vermiculata, Warr., Nov. Zool., viii, p. 12 (1901).

1 ♂, Kabauni, Brit. E. Africa. 1 ♂, Machakos.

The type, a female from Nakabimba, Toru, is in coll. Rothschild.

Tephroclystia perculsaria, nov.

♀. Palpi, antennæ, and frons dark brown, head, body, and fore-wings dark pinkish-brown, covered with minute brown irrorations; some brown minute marks in the interior of the wing, especially on the basal half of the median vein; very indistinct indications of numerous transverse grey bands on the outer third; a brown dot at the end of the cell; marginal line brown; cilia of both wings brown, interlined with pinkish-white; hind-wings pale grey, the irrorations thickest at the outer and abdominal margins, making them a little darker than the rest of the wing; under-side grey, without any definable markings.

Expanse of wings $\frac{8}{10}$ inch.

1 ♀, East Quaso, Masai (*Betton*) (type). 2 ♀, Kikuyu (*Crawshay*).

TEPHROCLYSTIA LUGUBRIARIA, nov.

♀. Antennæ, palpi, and frons blackish, head, body, and wings dark brown, more or less shining, covered with minute brown irrorations; fore-wings slightly darker than the hind-wings; veins dark brown, edged with faint whitish; a black dot pointed with white at the end of the cell; a sub-marginal row of distinct white dots; hind-wings without markings; cilia of both wings pinkish-white with brown patches; under-side of a uniform dark grey, without any distinct markings.

Expanse of wings $\frac{8}{10}$ inch.

Hab. RoROMO, Kikuyu (*Crawshay*).

Genus CHLOROCLYSTIS, Hübn., Verz., p. 323 (1818).

CHLOROCLYSTIS MARMORATA.

Chloroclystis marmorata, Warr., Nov. Zool., vi, p. 38 (1889).

1 ♂, 1 ♀, Sierra Leone. 1 ♀, River Niger, Sapele.

The type, a female from Warri, is in coll. Rothschild.

CHLOROCLYSTIS CONSOBRINA.

Calluga consobrina, Warr., Nov. Zool., viii, p. 11 (1901).

2 ♀, River Niger, Sapele.

The types from the Island of St. Thomé are in coll. Rothschild.

CHLOROCLYSTIS PROTRUSATA.

Chloroclystis protrusata, Warr., Nov. Zool., ix, p. 507 (1902).

3 ♂, 2 ♀, mile 478, Uganda Railway.

Warren's types from the Escarpment, Brit. E. Africa, are in coll. Rothschild.

CHLOROCLYSTIS SIERRARIA, nov.

♂, ♀. Grey with a pinkish-ochreous tinge; fore-wings with four transverse outwardly curved brown lines, sub-basal, ante-medial, shaded outwardly with brown at the costa, medial and discal, the medial line sinuous, the discal line rather near the outer margin; a spot inside the second line, another at the end of the cell; hind-wings with three lines corresponding to all but the sub-basal line of the fore-wings; marginal border of both wings broadly brown, including the outer line; cilia pale with brown patches; under-side pale grey, with the three outer lines visible.

Expanse of wings $\frac{1}{2}$ inch.

1 ♂, 2 ♀, Sierra Leone (*Clements*) (types).

Genus Gymnoscelis, Mab., Ann. Soc. Ent. Fr. (4), vii, p. 656 (1867).

Gymnoscelis birivulata.

Gymnoscelis birivulata, Warr., Nov. Zool., ix, p. 509 (1902).

1 ♀, Ngong, Machakos to Neugia.
The type, a female from St. Thomé, is in coll. Rothschild.

Genus Sauris, Guen., Phal., ii, p. 361 (1857).

Remodes, Guen., l. c., p. 362.
Holorista, Warr., Nov. Zool., i, p. 397 (1894).

Sauris spectabilis.

Holorista (?) *spectabilis*, Warr., l. c., vi, p. 36, ♂ (1899).

1 ♀, El Burgon, mile 478, Uganda Railway.
Warren's type, a male from Natal, is in coll. Rothschild.

Genus Eucestia, Hübn., Verz., p. 322 (1818).

Eucestia neddaria, nov.

♀. Antennæ and palpi brown, frons, head, and thorax pinkish-grey, with some brown hairs, thorax with a wedge-shaped brown mark in front; abdomen brown, second and last segments pinkish-grey; fore-wings with the costal space broadly brown, with some transverse darker markings, the space limited in front by a white apical streak; a white transverse bent line above the white streak one-fifth from apex; outer marginal border brown, the rest of the wing pinkish-grey, with a longitudinal oval brown spot, circled with black and white, in the centre of the wing, and a similar mark in the centre of the hinder margin, occupying the major portion of the margin; marginal line brown, interrupted by the veins; cilia white with a grey interline, with brown spots upon them; hind-wings brownish-grey, marginal line and cilia as in fore-wings; under-side pale brownish-grey; a brown dot at the end of each cell; fore-wings with a discal and hind-wings with a medial dentated line, and the latter with a suffused grey discal band.

Expanse of wings $1\frac{1}{10}$ inches.

2 ♀, mile 478, Uganda Railway (*Betton*).

Costal and sub-costal veins of hind-wings anastomosing for about three-fourths the length of the cell.

Genus LOBIDIOPTERYX, Warr., Nov. Zool., ix, p. 513 (1902).

LOBIDIOPTERYX VENINOTATA.

Lobidiopteryx veninotata, Warr., l. c.

2 ♀, Kikuyu, Brit. E. Africa.
Warren's types from the Escarpment are in coll. Rothschild.

Genus TRIMETOPIA, Guen., Phal., i, p. 352 (1857).

TRIMETOPIA ÆTHERARIA.

Trimetopia ætheraria, Guen., l. c., pl. 5, f. 9.

1 ♀, Usambara, E. Africa (Legros).
Guenée's type from Abyssinia is in the Paris Museum.
Antennæ pectinated in both sexes.

TRIMETOPIA CŒRULEA.

Trimetopia cærulea, Warr., Nov. Zool., v, p. 22 (1898).

1 ♀, Kikuyu (*Crawshay*).
The type, a male from Lamu, Brit. E. Africa, is in coll. Rothschild.

Family MONOCTENIINÆ.

Genus AFROPHYLA, Warr., Nov. Zool., ii, p. 83 (1895).

AFROPHYLA DICHORDATA.

Afrophyla dichordata, Warr., l. c.

1 ♂, 1 ♀, Kilimanjaro.
Warren's type, a female from Tiveta, is in coll. Rothschild.

Family ORTHOSTIXINÆ.

Genus RAMBARA, Moore, Lep. Ceylon, iii, p. 458 (1887).

RAMBARA PUELLA.

Zanclopteryx puella, Butler, Ann. Mag. N. H. (5), v, p. 391 (1880).

1 ♂, Madagascar (type).

RAMBARA SYLLARIA, nov.

♂. Antennæ, palpi, and frons dark brown, head, body, and wings white; fore-wings with the costal line brownish-ochreous; a discal

row of six or seven rather large spots, five of them in a row downwards, the two others near hinder margin a little beyond the middle; hind-wings with a dark brown spot at the end of the cell, a discal row of brownish-ochreous spots, outwardly curved in its centre; both wings with a brown lunular marginal line; wings thinly clothed; under-side pure white, without any markings.

Expanse of wings 1 inch.

Hab. Sierra Leone (*Clements*).

Rambara thearia, nov.

♂. Antennæ and frons brown; palpi, head, body, and wings white; fore-wings with a large dark brown spot at the end of the cell; macular bands pale brownish-ochreous, one ante-medial, outwardly curved, the other discal, bent inwards below the middle and then straight down to the hinder margin a little beyond the middle, the spots rather close together, the upper part of the band rather close to the outer margin; hind-wings with a brownish-ochreous spot at the end of the cell, and a discal macular band corresponding to the discal band of the fore-wings; outer margin of both wings with black dots; under-side pure white, a black dot at the end of the cell of fore-wings.

Expanse of wings $\frac{9}{10}$ inch.

2 ♂, Cameroons (*Prof. Sjostedt*).

Genus Brachytrita, nov.

Third joint of palpi obliquely upturned, short and blunt; fore-wing with cell less than half the length of the wing; vein 6 from the end, 7, 8, 9 and 10 stalked from just before end of cell, 11 anastomosing with 12; 10 anastomoses with 11 and then again with 8 and 9, forming a double areole: shape of wings much as in the genus *Alex*, Walker.

Brachytrita cervinaria, nov.

♂. Red fawn-colour, palpi with blackish-brown marks at the tips, frons brown; head, body, and wings very uniform in colour; a black spot at the end of the cell of fore-wings, a red-brown thin band from near apex of fore-wings to the abdominal margin of hind-wings before the middle; under-side paler and tinged with ochreous, both wings crossed by a sinuous grey medial line.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. Dar-es-Salaam (*Fruhstorfer*).

Genus PANAGROPSIS, Warr., Nov. Zool., p. 370 (1894).

PANAGROPSIS BIOCELLARIA.

Panagra biocellaria, Walker, xxvi, 1666 (1866).

1 ♀, without locality (type). 4 ♂, 5 ♀, Sierra Leone. 1 ♀, Old Calabar.

Genus CONOLOPHIA, Warr., Nov. Zool., i, p. 369 (1894).

CONOLOPHIA CONSCITARIA.

Panagra conscitaria, Walker, xxxiii, 986 (1861).
Panagra smilodontaria, Snellen, Tijd. v. Ent. (2), vii, p. 83, pl. 7, f. 1, 2 (1872).

1 ♂, Congo (type). 1 ♂, Kilimanjaro.
Walker's type is identical with Snellen's figure; it seems to be a widely-spread insect, there being also an example in the B. M. from the Transvaal.

Genus TERINA, Walker, ii, 464 (1854).

TERINA LATIFASCIA.

Terina latifascia, Walker, ii, 464.
Terina niphanda, Druce, P. Z. S., 1887, p. 671.
Bursada (?) *punctivorpus*, Warr., Nov. Zool., p. 240, pl. 5, f. 18, ♀ (1897).

4 ♂, Congo, including the type. 2 ♂, Kiusembo.
Druce's type from the Congo is in coll. Druce, and Warren's type from British Central Africa is in coll. Rothschild.
The width of the black bands is very variable.

TERINA TENUIFASCIA.

Terina tenuifascia, Holland, Psyche, vi, p. 412.

1 ♂, Ogave River (Holland).
The type from the same locality is in coll. Holland.

Genus PETOVIA, Walker, ii, 560 (1854).

Neurophana, Guen., Phal., ii, p. 167 (1857).

Petovia dichroaria.

Geometra dichroaria, Herr.-Schäff., Auss. Schmett., f. 189 (1854).
Petovia dichroaria, Walker, vii, 1685 (1856).
Neurophana dichroaria, Guen., l. c.
Petovia marginata, Walker, ii, 560, ♀ only.
Neurophana incertaria, Guen., l. c., pl. 20, f. 10.
Neurophana amatonga, Vuil., Bull. Soc. Ent. Fr., lxi, p. 194 (1892).

Vuillot's type came from E. Africa; Herrich-Schäffer and Guenée's types from S. Africa, and there are examples in the B. M. from the same locality.

Genus Paraptychodes, Warr., Nov. Zool., i, p. 379 (1894).

Paraptychodes tenuis.

Aletis tenuis, Butler, P. Z. S., 1878, p. 385.
Terina fulva, Hmpsn., Ann. Mag. N. H. (7), vi, p. 183 (1891).

2 ♀, Zanzibar, including the type. 1 ♀, Wasin, E. Africa (type *fulva*). 1 ♀, Subaki District, E. Africa.

Genus Aletis, Hübn., Verz., p. 179 (1818).

Aletis helcita.

Papilio helcita, Clerck, Icones, pl. 39, f. 4 (1764).
Phalæna fascelis, Linn., Mus. Ulr., 390, 25 (1764).
Phalæna macularia, Fabr., Sp. Ins., ii, 246, 27 (1781).
Papilio fuscifasciatus, Goeze, Ent. Beitr., iii (1), p. 121 (1781).
Aletis druryi, Butler, P. Z. S., 1878, p. 386.

4 ♀, Mongo-ma-lobok. 1 ♂, 3 ♀, W. Africa. 6 ♀, Old Calabar. 5 ♀, Isubu. 1 ♀, Ashanti. 1 ♂, 1 ♀, Congo. 1 ♂, 1 ♀, Accra. 1 ♀, Sierra Leone.

Fore-wings with veins 7, 8, 9 and 10 stalked, 11 from cell, less than half-way from the base, connected with 7 at its base by an oblong bar, 7 also connected with 8 by a bar one-third from its origin, forming a very large areole, 12 free from base to costa, one-third before apex; antennæ of male with short pectinations.

Aletis rubricaput, nov.

♂. Superficially resembling *A. helcita*, Clerck, but the antennæ

are long and pubescent, not with short pectinations as in *helcita*, the palpi (except for the black tip), pectus, and top of head are bright crimson, frons black, whereas in *helcita* the frons, pectus, and palpi are ochreous and the top of the head is black; the neuration is similar.

Expanse of wings $4\frac{6}{10}$ inches.

Hab. GOLD COAST.

Venation as in *Aletis*.

Genus LEPTALETIS, Warr., Nov. Zool., i, p. 379 (1894).

LEPTALETIS VARIABILIS.

Aletis variabilis, Butler, P. Z. S., 1878, p. 386.

2 ♀, Ambriz, including the type. 1 ♂, Angola.

Vein 11 of fore-wings from beyond the middle of the cell, consequently the areole is much shorter than in *Aletis*.

LEPTALETIS FORBESI.

Aletis forbesi, Druce, P. Z. S., 1884, p. 227, pl. 17, f. 4, ♂.
Aletis erici, Kirby, Ann. Mag. N. H. (6), xviii, p. 382, ♀ (1896).
Cartaletis flexilimes, Warr., Nov. Zool., iv, p. 28 (1897).

2 ♂, Old Calabar. 1 ♀, Port Alice, W. Africa (*Kirby's* type).

The type from W. Africa is in coll. Druce. Warren's types, ♂, ♀, are from Warri, Niger, in coll. Rothschild.

Genus CARTALETIS, Warr., Nov. Zool., i, p. 378 (1894).

CARTALETIS ETHELINDA.

Aletis ethelinda, Kirby, Ann. Mag. N. H. (6), xviii, p. 381 (1896).

Antennæ more heavily pectinated than in *Aletis* or *Leptaletis*.

Vein 10 of fore-wing anastomoses with 11, and then with 8 and 9 forming a double areole.

1 ♂, 1 ♀, Parumbiro, E. Africa (types).

The pectinations of the antennæ of the males are longer than in those of the preceding species.

CARTALETIS MONTEIRONIS.

Aletis monteironis, Druce, Ent. Mo. Mag., xx, p. 156 (1883).

In coll. Swinhoe from Lorenzo Marquez. Many examples in B. M. from S. Africa.

Species described as such, that do not belong to the African Geometridæ.

Crocinis fenestrata, Butler, Ann. Mag. N. H. (5), iv, p. 244 (1879), Madagascar, belongs to the *Drepanulidæ*.

Scotosia congoata, Walker, xxv, 1351.

= *Calocalpe* (*Scotosia*) *affirmata*, Guen., Phal., ii, p. 447, pl. 9, f. 2.

A common South American moth: Walker's type has no register number on it, and therefore it is impossible to trace from whence it came, but undoubtedly a wrong locality label has got on the pin, and this moth must be taken out of the African list.

NOT IN B. M.

BOARMIINÆ.

Simopteryx (?) *cervina*, Warr., Nov. Zool., i, p. 457, Madagascar.

Æschropteryx (?) *ansorgei*, Warr., l. c., viii, p. 17, Fort Beni.

Æschropteryx atomaria, Warr., l. c., p. 216, Nandi.

Epigynopteryx abbreviata, Warr., l. c., p. 19, St. Emina, Busiro.

Epigynopteryx tabitha, Warr., l. c., Uganda.

Epigynopteryx commixta, Warr., l. c., p. 216, Nandi.

Epigynopteryx brunnea, Warr., l. c., p. 63, Warri.

Plegapteryx (?) *syntomia*, Plotz, S. E. Z., xli, p. 85 (1880), W. Africa.

Plegapteryx (?) *silacea*, Plotz, l. c., p. 86, W. Africa.

Xylopteryx (*Cidaria*) *raphaelaria*, Oberth., Ann. Mus. Genov., xv, p. 180, pl. 1, f. 5 (1880), Abyssinia, from its figure evidently a *Xylopteryx* close to *versicolor*, Warr.

Xylopteryx (*Odontopera*) *integraria*, Guen., Phal., i, p. 166 (1857), Abyssinia.

Syngria hamularia, Snellen, Tijd. v. Ent. (2), vii, p. 79, pl. 6, f. 11 (1873), Lower Guinea.

Scodiona scapularia, Snellen, l. c., p. 84, pl. 6, f. 4, Lower Guinea.
Epione malefidaria, Mab., C. R. Ent. Belg., xxiii, p. 22 (1880), Madagascar.
Caberodes insularia, Mab., l. c., Madagascar.
Caberodes russulata, Mab., Ann. Soc. Ent. Fr., 1897, p. 226, Comoro Island.
Caberodes hemigrammata, Mab., l. c., p. 227, Comoro Island.
Cabera vulgaria, Plotz, S. E. Z., xli, p. 302 (1880), Cameroons.
Stegania ruberata, Mab., l. c., 1900, p. 736, Madagascar.
Stegania luteorubens, Mab., l. c., p. 737, Madagascar.
Psamatodes arenularia, Mab., C. R. Ent. Belg., xxiii, p. 24 (1880), Madagascar.
Parasynegia rufigrisea, Warr., l. c., vii, p. 94, Old Calabar.
Eupagia albistriga, Warr., l. c., vi, p. 311, Madagascar.
Sphingomima heterodoxa, Warr., l. c., p. 312, Warri.
Paracrocota epionata, Warr., l. c., iv, p. 258, Lower Niger.
Paracrocota perviata, Warr., l. c., p. 259, Sirabe, N. Betsilu.
Paracrocota semirufa, Warr., l. c., viii, p. 20, Fort Beni.
Aspilates chiarinii, Oberth., l. c., xviii, p. 739, pl. 9, f. 9, Abyssinia.
Hyposidra gumppenbergi, Moesch., Abh. senck., Nat. Ges., xv, p. 96, f. 5 (1888), W. Africa.
Hypochrosis massagaria, Karsch, Ent. Nachr., xxi, p. 359, pl. 2, f. 10 (1895), Cameroons.
Omiza tortuosa, Warr., l. c., iv, p. 258, pl. 5, f. 24, Congo.
Crocinis atricostaria, Mab., Ann. Soc. Ent. Fr., 1897, p. 229, Madagascar.
Heterolocha indiscretaria, Mab., l. c., p. 227, Madagascar.
Metrocampa ferruginaria, Mab., l. c., p. 231, Comoro Isld.
Conchylia smithii, Holland, in Smith and Donaldson's Through Unknown African Countries, App. D., p. 419, f. 12 (1897), E. Africa.
Phorodesma hemistrigata, Mab., l. c., 1900, p. 740, Madagascar.
Orsonoba trivittata, Mab., l. c., p. 737, Madagascar.
Zamarada (*Stegania*) *hyalinaria*, Guen., l. c., p. 45, Abyssinia.
Zamarada (*Stegania*) *secutaria*, Guen., l. c., Abyssinia.
Zamarada (*Stegania*) *indularia*, Guen., l. c., p. 46, Abyssinia.
Zamarada auratisquama, Warr., l. c., iv, p. 122, Warri.
Zamarada undimarginata, Warr., l. c., p. 123, R. Niger.

Zamarada ansorgei, Warr., l. c., p. 261, Kiboko, Brit. E. Africa.
Zamarada crystallophana, Mab., l. c., p. 741, Madagascar.
Zamarada angustimargo, Warr., l. c., viii, p. 212, Angola.
Zamarada (?) *confusa*, Warr., l. c., Angola.
Zamarada flavicaput, Warr., l. c., Angola.
Zamarada ochrata, Warr., l. c., ix, p. 518, Escarpment.
Neuropolodes sphingata, Warr., l. c., ii, p. 150, Calabar.
Aplochlora invisibilis, Warr., l. c., iv, p. 76, River Niger.
Peridela crassata, Warr., l. c., p. 110, Mpeta.
Peridela curvifascia, Warr., l. c., Mpeta.
Cophophlebia olivata, Warr., l. c., p. 116, Zomba.
Eurythecodes nigricola, Warr., l. c., p. 117, Warri.
Eurythecodes straminea, Warr., l. c., Warri.
Eurythecodes maculosata, Warr., l. c., viii, p. 216, Congo.
Eurythecodes mutabilis ab. *pallida*, *punctata* and *immaculata*, Warr., l. c., x, p. 277, Escarpment.
Hyostomodes nubilata, Warr., l. c., iv, p. 252, pl. 5, f. 11, Innari, Brit. E. Africa.
Anonychia flexilinea, Warr., l. c., v, p. 34, Lake Nyassa.
Procypha conformis, Warr., l. c., p. 39, Warri.
Choregia consocia, Warr., l. c., vi, p. 300, Uganda.
Idiotephra curvivena, Warr., l. c., p. 61, River Niger.
Hyperythra miegii, Mab., Le Nat., ii, p. 135 (1882), Madagascar.
Petrodava olivata ab. *insularis*, Warr., l. c., Madagascar.
„ ab. *perfusca*, Warr., l. c., p. 308, Unyoro.
Pigiopsis convergens, Warr., l. c., p. 301, Uganda.
Xenostega fallax, Warr., l. c., p. 302, Unyoro.
Melinoessa pauper, Warr., l. c., viii, p. 210, Nandi.
Cacostegania australis, Warr., l. c., p. 211, Angola.
Acanthoscelis ansorgei, abs. *subrufa* and *diffusa*, Warr., l. c., p. 215, Nandi.
Pigiopsis parallelaria, Warr., l. c., ix, p. 518, Escarpment.
Petelia pictilinea, Warr., l. c., p. 522, Escarpment.
Mesocoela obscura, Warr., l. c., p. 531, Escarpment.
Dasymacaria ansorgei, Warr., l. c., viii, p. 18, Fort Beni.
Fidonia zerenaria, Mab., Bull. Soc. Ent. Fr., iii, p. xcii (1879), Madagascar.
Fidonia (?) *cristataria*, Plotz, S. E. Z., xli, p. 303, Victoria, W. Africa.
Macaria catalcucaria, Mab., Ann. Soc. Ent. Fr., 1897, p 229, Zanzibar.

Macaria albogriscaria, Mab., l. c., 1900, p. 736, Madagascar.
Semiothisa ostentosaria, Moesch., Abh. senck. Nat. Ges., xv, p. 93 (1888), W. Africa.
Semiothisa fuscataria, Moesch., l. c., p. 94, W. Africa.
Semiothisa parallacta, Warr., l. c., iv, p. 112, Zanzibar.
Semiothisa curvilineata, Warr., l. c., vi, p. 309, Nandi.
Semiothisa fulvimargo, Warr., l. c., Unyoro.
Gonodela commixta, Warr., l. c., iv, p. 106, Warri.
Gonodela mundipennis, Warr., l. c., viii, p. 213, Angola.
Azata sororcula, Warr., l. c., iv, p. 105, Zomba.
Azata diffusata, Warr., l. c., ix, p. 528, Upper Congo.
Azata separata, Warr., l. c., p. 59, Mikindani.
Acadra affinis, Warr., l. c., lx, p. 527, Uganda.
Evarzia nana, Warr., l. c., v, p. 250, Warri.
Callctæra ansorgei, Warr., l. c., x, p. 275, Niger.
Luxiaria tæniata, Warr., l. c., iv, p. 109, Warri.
Tephrina malesignaria, Mab., C. R. Ent. Belg., xxiii, p. 23 (1880), Madagascar.
Tephrina univirgaria, Mab., l. c., p. 24, Madagascar.
Tephrina inæquivirgaria, Mab., Ann. Soc. Ent. Fr., 1890, p. 49, W. Africa.
Tephrina subcurvaria, Mab., l. c., 1897, p. 228, W. Africa.
Tephrina monacmaria, Mab., l. c., p. 229, W. Africa.
Tephrina polyacmaria, Mab., l. c., p. 230, W. Africa.
Psilocrea turpis, Warr., l. c., W. Africa.
Pseudalcis (?) *pectinata*, Warr., l. c., iv, p. 97, Warri.
Alcis contortilinea, Warr., l. c., p. 245, Upoto.
„ ab. *simplex*, Warr., l. c., v, p. 247, Congo.
Alcis simulatrix, Warr., l. c., vi, p. 305, Uganda.
Alcis argillacea, Warr., l. c., vii, p. 95, Congo Free State.
Alcis ansorgei, Warr., l. c., viii, p. 15, Congo Free State.
Alcis remotata, Warr., l. c., p. 16, Nakabimba.
Chogada subcincta, Warr., l. c., viii, p. 16, St. Thomé.
Boarmia basilaria, Mab., Ann. Soc. Ent. Fr., 1890, p. 47, W. Africa.
Boarmia obstitaria, Mab., l. c., W. Africa.
Boarmia monogrammaria, Mab., l. c., p. 48, Zanzibar.
Boarmia atrilunaria, Mab., Ann. Soc. Ent. Belg., xxxvii, p. 63 (1893), Mauritius.
Boarmia antelmaria, Mab., l. c., p. 64, Mauritius.
Boarmia suboccularia, Mab., l. c., W. Africa.
Tephrinopsis assimilis, Warr., l. c., vi, p. 310, Unyoro.
Tephrinopsis sabulifera, Warr., l. c., Unyoro.
*Tephrinopsis illinea*ta, Warr., l. c., viii, p. 214, Benguela.

Tephrinopsis ochriciliata, Warr., l. c., Angola.
Tephrinopsis trinotata, Warr., l. c., ix, p. 530, Escarpment.
Chorodnodes rothi, Warr., l. c., iv, p. 105, Warri.
Geometra (!) *diospyrata*, Boisd., Faun. Ent. Madag., p. 115, Madagascar.
Eubyja grisea, Warr., l. c., p. 91, Zomba.
Eubyja (?) *expansa*, Warr., l. c., vi, p. 48, Niger.
Darisa (?) *dissimilis*, Warr., l. c., iv, p. 247, pl. 5, f. 17 and 19, Mauritius.
Darisa ochrimacula, Warr., l. c., ix, p. 520, Escarpment.
Calicha brunnea, Warr., l. c., vi, p. 305, Unyoro.
Catascia rufiplaga, Warr., l. c., ix, p. 524, Escarpment.
Ectropis nigripunctata, Warr., l. c., iv, p. 93, Warri.
Ectropis subaurata, Warr., l. c., vi, p. 306, Mpeta.
Psilocerea fulva, Warr., l. c., ix, p. 532, Escarpment.
Psilocerea nigrocumulata, Warr., l. c., p. 533, Escarpment.
Hemerophila tetragraphicata, Saalm., Ber. senck. Ges., 1880, p. 294, Nossi Bé.
Hemerophila mauritiaria, Mab., Ann. Soc. Ent. Belg., xxxvii, p. 62 (1893), Mauritius.
Hemerophila aborta, Warr., l. c., v, p. 247, Uganda.
Hemerophila obtusata ab. *regulata*, Warr., l. c., ix, p. 521, Escarpment.
Gnophos biafaria, Plotz, S. E. Z., xli, p. 303, W. Africa.
Tephrosia griscoalbata, Mab., l. c., p. 63, Madagascar.
Lepiodes ocellata, Warr., l. c., p. 94, Mpeta.
Thysanopyga subalba, Warr., l. c., viii, p. 17, St. Thomé.
Calamodes lignaria, Warr., l. c., x, p. 275, Angola.
Euomœa unilineata, Warr., l. c., iv, p. 124, Zomba.
Turckheimeria argentiplaga, Warr., l. c., p. 243, Stanley Pool.
Turckheimeria rubriplaga, Warr., l. c., Sierra Leone.
Ereunetea fulgida, Warr., l. c., vi, p. 303, Bopoto.
Pachypalpia subalbata, Warr., l. c., vii, p. 98, Ikutha.
Bordeta longimacula, Warr., l. c., iv, p. 83, Dar-es-Salaam.
Mesomima albifrons, Warr., l. c., p. 85, French Congo.
Pitthea fractimacula, Warr., l. c., p. 242, Stanley Pool.
Hylemera flavibasis, Warr., l. c., p. 241, Cameroons.
Hylemera ansorgei, Warr., l. c., vi, p. 303, Uganda.
Hylemera discinota, Warr., l. c., Unyoro.
Negla (*Nolera*) *melanthiata*, Mab., Bull. Soc. Ent. Fr., 1891, p. 127, Gaboon.

GEOMETRINÆ.

Hypochroma abyssiniaria, Guen., Phal., i, p. 277 (1857), Abyssinia.
Hypochroma eugrapharia, Mab., Ann. Soc. Ent. Fr., 1879, p. 347, Madagascar.
Hypochroma batiaria, Plotz. S. E. Z., xli, p. 302 (1880), Victoria, W. Africa.
Hypochroma signifrontaria, Mab., Ann. Soc. Ent. Belg., xxxvii, p. 65 (1893), Mayotte.
Agathia confuscata, Warr., l. c., iv, p. 32, Sierra Leone.
Chlorommia persimilis, Warr., l. c., p. 36, Warri.
Chlorostrota marginata, Warr., l. c., Warri.
Collesis mimica, Warr., l. c., p. 37, Mpeta.
Episothalma semigrisea, Warr., l. c., p. 38, Congo.
Episothalma excavata, Warr., l. c., v, p. 234, Warri.
Hemithea vermiculata, Warr., l. c., iv, p. 41, Warri.
Hemithea dentata, Mab., Ann. Soc. Ent. Fr., 1900, p. 740, Madagascar.
Hypocœla subfulva, Warr., l. c., p. 44, Warri.
Neurotoca notata, Warr., l. c., p. 43, Mpwapwa.
Pareuchloris (?) *salsa*, Warr., l. c., Sierra Leone.
Pareuchloris (?) *simplex*, Warr., l. c., ix, p. 496, Escarpment.
Euchloris ochrea, Warr., l. c., iv, p. 210, pl. 5, f. 21, Dar-es-Salaam.
Gelasma fuscipuncta, Warr., l. c., v, p. 13, Madagascar.
Thalassodes simiaria, Guen., Phal., i, p. 359, Senegal.
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Thalassodes rufomarginata, Pag. Jahrb. Hamb. Aust., x, p. 252 (1893), E. Africa.
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Thalassodes albifimbria, Warr., l. c., iv, p. 216, Blantyre.
Thalassodes rubrimacula, Warr., l. c., vi, p. 292, Unyoro.
Thalassodes pupillata, Warr., l. c., ix, p. 496, Escarpment.
Thalassodes stictimargo, Warr., l. c., p. 497, Escarpment.
Thalassodes unicolor, Warr., l. c., Niger.
Thalassodes opaca, Warr., l. c., v, p. 17, Warri.
Œnospila flavitænia, Warr., l. c., p. 13, Warri.
Œnospila rubricorpus, Warr., l. c., v, p. 235, Warri.
Probolosceles (?) *esmeralda*, Warr., l. c., p. 15, Warri.

Syndromodes tenuis, Warr., l. c., p. 16, Warri.
Prasinocyma dohertyi, Warr., l. c., x, p. 271, Escarpment.
Prasinocyma diaphana, Warr., l. c., vi, p. 291, Madagascar.
Victoria perornata, Warr., l. c., v, p. 237, Warri.
Victoria ansorgei, Warr., l. c., viii, p. 8, Nakabimba.
Chrysocraspeda rosina, Warr., l. c., p. 238, Nakabimba.
Chrysolene rubripennis, Warr., l. c., Congo.
Chrysolene sanguinolenta, Warr., l. c., Warri.
Lathochlora inornata, Warr., l. c., vii, p. 91, Warri.
Chlorodrepana angustimargo, Warr., l. c., viii, p. 7, Sierra Leone.
Chlorodrepana rothi, Warr., l. c., vi, p. 22, Warri.
Antharmostes (?) *albisticta*, Warr., l. c., viii, p. 205, Nandi.
Antharmostes mesoleuca, Warr., l. c., vi, p. 21, Warri.
ab. *marginata*, Warr., l. c., p. 290, Warri.
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Eucrostes albistrigata, Pag., l. c., E. Africa.
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Eucrostes innotata, Warr., l. c., viii, p. 205, Benguela.
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= *Comostola stillaria*, Feld., Reise, Nov., pl. 127, f, 17.
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Comostolopsis cærulea, Warr., l. c., p. 494, Escarpment.
Comostolopsis (?) *anomala*, Warr., l. c., p. 495, Escarpment.
Paragathia albimarginata, Warr., l. c., ix, p. 495, Angola.
Hydata (?) *dubia*, Warr., l. c., vi, p. 24, Warri.
Leucoglyphica (?) *fasciata*, Warr., l. c., p. 25, Warri.
Acollesis umbrata, Warr., l. c., p. 290, Unyoro.
Microloxia divergens, Warr., l. c., p. 291, Unyoro.
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Phyle (?) *banakaria*, Plotz, S. E. Z., xli, p. 302, Victoria, W. Africa.
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Nemoria chlorinaria, Mab., Ann. Soc. Ent. Fr., 1897, p. 230, Madagascar.

Nemoria viridellaria, Mab., l. c., p. 231, Mauritius.
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Thalera ostracites, Karsch., Ent. Nachr., xxvi, p. 370, Madagascar.

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Pisoraca (?) *inornata*, Warr., l. c., v, p. 241, Warri.
Pisoraca inæqualis, Warr., l. c., ix, p. 501, Barotse.
Cosymbia unocula, Warr., l. c., iv, p. 217, Dar-es-Salaam.
Lipomelia irregularis, Warr., l. c., v, p. 239, and vi, p. 295, Warri.
Lipomelia striata, Warr., l. c., iv, p. 220, Warri.
Induna curvimargo, Warr., l. c., vii, p. 92, Mpeta.
Induna albida, Warr., l. c., vi, p. 295, Usuga.
Lissoblemma viridifusa, Warr., l. c., ix, p. 500, Upper Congo.
Pylarge candidaria, Warr., l.c., p. 504, Escarpment.
Cacorista amputata, Warr., l. c., vi, p. 292, Unyoro.
Cacorista rufimixta, Warr., l. c., viii, p. 207, Ogrugu.
Mnesithetis delicata, Warr., l. c., p. 295, Masindi.
Lycauges concurrens, Warr., l. c., iv, p. 57, Mpeta.
Lycauges extremata, Warr., l. c., Akassa.
Lycauges fragilis, Warr., l. c., x, p. 272, Escarpment.
Chlorocraspedia improba, Warr., l. c., vi, p. 294, Unyoro.
Acidalia pulveraria, Snellen, Tijd. v. Ent. (2), vii, p. 75, pl. 6, f. 7, Lower Guinea.
Acidalia reconditaria, Snellen, l. c., p. 76, pl. 6, f. 8, Lower Guinea.
Acidalia fæculentaria, Mab., C. R. Ent. Belg., xxxiii, p. 23, Madagascar.
Acidalia punctistriata, Mab., l. c., Madagascar.
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Acidalia agrammaria, Mab., l. c., Madagascar.
Acidalia cuspidata, Mab., l. c., Madagascar.
Acidalia limbolata, Mab., l. c., Madagascar.
Acidalia terrearia, Mab., l. c., p. 739, Madagascar.
Acidalia rufolutaria, Mab., l. c., Madagascar.
Acidalia holobapharia, Mab., l. c., Madagascar.
Acidalia latifera, Walker, Proc. N. H. Soc. Glasg., i, p. 332 (type lost), Congo.
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Craspedia sufficiens, Warr., l. c., Cameroons.
Craspedia subperlaria, Warr., l. c., p. 53 and v, p. 241 Warri.
Craspedia sagittilinea, Warr., l. c., p. 219, Mombasa.
Craspedia uninotata, Warr., l. c., Sierra Leone.
Craspedia exquisita, Warr., l. c., pl. 5, f. 10, Upper Shiré River.
Craspedia flavissima, Warr., l. c., v, p. 239, Warri.
Craspedia hæmalcata, Warr., l. c., p. 240, Warri.
Craspedia pyraliata, Warr., l. c., Warri.
Craspedia (?) *submarginata*, Warr., l. c., p. 241, Warri.
Craspedia transsecta, Warr., l. c., Warri.
Craspedia dissimulans, Warr., l. c., vi, p. 31, Warri.
Craspedia habilis, Warr., l. c., Warri.
Craspedia improba, Warr., l. c., p. 294, Unyoro.
Craspedia ochreofusa, Warr., l. c., Unyoro.
Craspedia tenera, Warr., l. c., Nandi.
Craspedia tricommata, Warr., l. c., Unyoro.
Craspepia planipennis, Warr., l. c., vii, p. 91, Sierra Leone.
Craspedia rufinubes, Warr., l. c., Unyoro.
Craspedia impunctulata, Warr., l. c., viii, p. 9, Sierra Leone.
Craspedia ocellicincta, Warr., l. c., Athi-ya-Mawe.
Craspedia umbratilinea, Warr., l. c., Kilimanjaro.
Craspedia crassipuncta, Warr., l. c., p. 207, Benguela.
Craspedia fuscobrunnea, Warr., l. c., Nandi.
Craspedia sincera, Warr., l. c., p. 208, Angola.
Craspedia agrapta, Warr., l. c., ix, p. 498, Escarpment.
Craspedia argentidisca, Warr., l. c., Escarpment.
Craspedia muscosaria, Warr., l. c., p. 499, Escarpment.
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Craspedia naias, Warr., l. c., x, p. 272, Escarpment.
Eois roseocincta, Warr., l. c., vi, p. 32, Dar-es-Salaam.
Janarda flamingo, Warr., l. c., viii, p. 208, Angola.
Ptychopoda rufulata, Warr., l. c., p. 11, St. Thomé.
Ptychopoda mundipennis, Warr., l. c., v, p. 21, Madagascar.
Ptychopoda subscutulata, Warr., l. c., vi, p. 295, Masindi.
Ptychopoda inobtrusa, Warr., l. c., v, p. 243, Warri.
Ptychopoda auriflua, Warr., l. c., ix, p. 502, Barotse.
Ptychopoda laciniata, Warr., l. c., Escarpment.
Ptychopoda lilliputaria, Warr., l. c., Angola.
Ptychopoda nitescens, Warr., l. c., Escarpment.
Ptychopoda œnozonata, Warr., l. c., p. 503, Kilwa, Germ. E. Africa.

Ptychopoda parallelaria, Warr., l. c., Escarpment.
Ptychopoda recurvinota, Warr., l. c., Escarpment.
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Sterrha crescentifera, Warr., l. c., ix, p, 504, Lialui.
Traminda glauca, Warr., l. c., iv, p. 64, Sierra Leone.
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Ptochophyle hilaris, Warr., l. c., v, p. 242, Warri.
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Larentia peremptata, Walker, xxiv, 1191 (type lost), Sierra Leone.
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Epirrhoë subrufaria, Warr., l. c., x, p. 273, Escarpment.
Leucoxena lactea, Warr., l. c., vii, p. 94, Ikutha.
Ochyria trientata, Warr., l. c., viii, p. 210, Nandi.
Ochyria ansorgei, Warr., l. c., vi, p. 299, Uganda.
Cosmorhoë annulifera, Warr., l. c., ix, p. 515, Escarpment.
Dichroma alternata, Warr., l. c., viii, p. 209, Angola.
Synthalia innocens, Warr., l. c., ix, p. 506, Escarpment.
Anisobole transscissa, Warr., l. c., p. 514, Escarpment.
Ctenaulis albirupta, Warr., l. c., p. 515, Escarpment.
Plerocymia arenaria, Warr., l. c., p. 518, Escarpment.
Ansorgia divergens, Warr., l. c., vi, p. 298, Uganda.
Perizoma cancellata, Warr., l. c., p. 300, Masindi.
Coremia melissaria, Guen., Phal., ii, p. 411, Central Africa.
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Xanthorhoë conchata, Warr., l. c., v, p. 29, Nandi.
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Chloroclystis grisea, Warr., l. c., iv, p. 227, Mombasa.
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Tephroclystia devestita, Warr., l. c., vi, p. 40, Uganda.
Tephroclystia atomaria, Warr., l. c., ix, p. 510, Escarpment.
Tephroclystia celatisigna, Warr., l. c., Escarpment.
Tephroclystia immensa, Warr., l. c., p. 511, Escarpment.
Tephroclystia semiflavata, Warr., l. c., p. 512, Escarpment.
Tephroclystia bryophilaria, Warr., l. c., x, p. 273, Escarpment.
Tephroclystia connexa, Warr., l. c., vi, p. 297, Unyoro.
Gnamptoloma muscosa, Warr., l. c., ix, p. 508, Escarpment.
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Gymnoscelis crassata, Warr., l. c., viii, p. 208, St. Thomé.
Gymnoscelis tenera, Warr., l. c., p. 209, Ogrugu.
Gymnoscelis acutipennis, Warr., l. c., ix, p. 508, Escarpment.
Gymnoscelis carneata, Warr., l. c., p. 509, Escarpment.
Gonanticlea carnifasciata, Warr., l. c., vi, p. 299, Unyoro.

MONOCTENIINÆ.

Xantheliodes uniformis, Warr., l. c., iv, p. 31, Zomba.

ORTHOSTIXINÆ.

Mimaletis humilis, Warr., l. c., i, p. 378, Gaboon.
Leptaletis pallida, Warr., l. c., p. 379, Sierra Leone.

XXII. Hymenoptera Aculeata *from Majorca* (1901) *and Spain* (1901–2). By Edward Saunders, F.R.S. *With Introduction, Notes, and Appendix* by Prof. Edward B. Poulton, F.R.S.

[Read June 1st, 1904.]

I. Majorca (1901).

The Majorcan Aculeates named and described by Mr. Saunders in this memoir were collected by Mr. W. Holland, of the Hope Department, Oxford, Mr. A. H. Hamm, of the same Department, and myself. The entire collection was made from June 26 to July 12, 1901, in the neighbourhood of Palma, Soller and Pollensa, or in travelling between these places.

On returning home with many thousands of specimens belonging to nearly all groups, including those obtained in a week's hard work on the mainland, the expenditure of an immense amount of careful mechanical labour was necessary before the work of determination could begin. Interrupted by calls which could not be postponed, about eighteen months elapsed before I was in a position to submit the Aculeates to my kind friend, Mr. Edward Saunders, F.R.S., who has rendered such memorable help to the Hope Department on many occasions.

The Majorcan Aculeates numbered rather over 3680, and of these about 2500 were in the first instance examined by Mr. Saunders. The remaining specimens, which had been looked upon as duplicates of the commonest species, were subsequently studied by him, and a few species of interest recovered from among them.

It will be seen in his memoir that Mr. Saunders recognises five new species in this material:—*Pompilus poultoni*, *Mimesa palliditarsis*, *Halictus dubitabilis*, *H. hollandi*, and *H. hammi*.

It is unnecessary again to describe the features of this beautiful island with its triple division into (1) level highly-cultivated plains, (2) mountains chiefly developed along the N.-W. coast, and (3) low marshy land on the N.-E. bordering parts of the bays of Alcudia and Pollensa.

After my first visit to Majorca in 1900 I gave some account of the main characteristics which appeal to the naturalist (Ent. Monthly Magazine, Sept. 1901, p. 205). All three types of country were included in the route taken in 1902, of which a brief account is given below.

June 26.—We landed at Palma in the morning after an all-night passage from Barcelona. In the afternoon we took the Porti Pi tram in order to visit the hill, on the summit of which Bellver Castle stands at a height of 400 ft. "This was the most favourable locality . . . met with during the visit in 1900" (l. c., p. 206), and here I caught the fine new species of *Nomada* described by Mr. Edward Saunders (l. c., pp. 209, 210). In July the conditions had greatly changed. The flowers were over and withered on the exposed surface, and the locality was not especially productive.

After collecting for a time, we descended the heath-covered southern slope and made our way to the coast, a little beyond Porto Pi, working the top and occasionally the face of the low cliffs beside the coast road running out of Palma in a S.-W. direction. Along this little strip of coast there was every degree of slope, while a considerable number of flowers were still to be found. Although it was late in the afternoon insects were fairly abundant and varied.

June 27.—The experience of the previous day induced us to make further trial of the coast beyond the tram terminus at Porto Pi. We explored the varied types of collecting ground to be found along the cliffs as far as the 6th kilometre on the coast road. At Porto Pi itself, and again at the furthest point, a little bay was found, with favourable ground running down to sea-level. At the 6th kilometre we explored part of a valley which ran inland from the bay. A fine rounded, heath-clad hill rising behind the cliffs was also traversed.

June 28.—Mr. Holland was ill and unable to walk. Mr. Hamm and I collected for 13 kilometres along the straight, level highway running S.-E. of Palma to Lluchmayor. We never wandered far from this glaring, dusty road, occupying most of the time upon the wayside flowers, where insects were abundant. Irrigation tanks, fields of lucerne, and on one occasion an old garden were also visited. The whole day's work lay in the fertile and highly-cultivated plain.

June 29.—During my visit in the previous year I had made a special note of the Pass of Soller, 22 kilometres from Palma, as likely to be a favourable locality. The varied character of the ground, the numerous plants, the high elevation above the Plain of Palma behind, and the Valley of Soller in front, the descent on both sides, the much higher ground readily accessible on either hand, all pointed to the Pass as a place in which a naturalist might well spend a few days.

We started to drive across the Plain of Palma towards the foot of the Pass, without any certainty that we should find a place to sleep in. When well out in the middle of the Plain we stopped at a neglected field covered with umbelliferous flowers and collected for an hour. I had specially bargained at the Fonda Mallorca for a most persuasive driver, who would do his best to induce the proprietress of the little inn on the summit to allow us to stay. He certainly acted up to his promise, and undeterred by repeated failure, plied every oratorical art for a considerable part of the afternoon. Although several times the hostess seemed to be upon the point of yielding she was finally inexorable. At last, however, she suggested that we should ask if we might stay at a neighbouring house—Son Allegra—where Señor Antonio Pascual resided. Here we were kindly received, and here our collection attracted the most lively interest and inquiry. In dumb show—for the Señor understood no English, and I only a word or two of Mallorquin—I was asked whether our captures were not intended to be stirred up in water and drunk as a medicine! The idea that insects were taken in order to be eaten or used as medicine was also met with many times in various parts of the island.

Towards the close of that afternoon we collected upon the summit of the Pass and the eastern slope rising from it.

June 30.—The whole of this day was occupied in working the summit and the slopes rising and descending from it.

July 1.—The steep southern slope leading from the summit to the Plain of Palma was explored from top to bottom, and a little work was done on the edge of the Plain.

July 2.—This day was passed like June 30, at and near the summit. I explored the high ground rising to the

west and found it favourable. Beyond the gardens of the few houses on this side of the Pass rose wooded slopes thinly covered with trees of medium size; beyond these cornfields were found bordered in certain parts by abundant flowers. Higher still was the bare mountain side; although even here the frugal islanders do not leave Nature to herself, for they turn out those most destructive of domestic mammals, goats and pigs.

July 3.—These western slopes rising high above the Pass seemed so favourable that we all spent July 3 in again exploring them.

July 4.—We left the Pass with regret. The view to the south of the vast Plain of Palma was a striking and beautiful contrast with that to the north,—the Valley of Soller shut in by steep hillsides, with the magnificent outline of the Puig Mayor, the highest mountain in the island, rising behind Soller itself in the centre of the picture.

The locality would probably be far more productive a little earlier in the year. Should any entomologist think of collecting there it will not be out of place to inform him that the only food consists of eggs, bread, fruit, coffee, and goats' milk. The fowls are not to be recommended.

We walked down the northern slope into Soller in the morning, collecting by the roadside. In the afternoon we worked between Soller and its Port, $2\frac{1}{2}$ miles distant, taking the majority of our captures from the flowers on the sides of the dry river-bed near the little town.

July 5.—All the baggage which could be dispensed with had been left in Palma, together with the captures made before June 29. The collections accumulated since the start for Soller Pass were loaded, with our very moderate supply of luggage, on the back of one mule, for the journey by mountain roads to Lluch and then Pollensa. As I watched the mass of boxes and bundles swaying from side to side and up and down, I was filled with needless fear for the safety of the specimens. The motion, with all its amplitude and rapidity, is so absolutely smooth and springy, and so devoid of sudden jerks, that not a single insect was displaced or in the slightest degree injured by the two days' journey.

Our course lay up the steep Barranco, above which some very fine upland collecting ground was traversed. In one flowery valley *Argynnis pandora* was seen in some numbers. It was only met with singly in other

localities in the island. At one point where a mountain stream formed a deep pool in a narrow rocky gorge, a species of *Notonecta* abounded in the water. Many an interesting and favourable locality made us regret that it was necessary to reach Lluch that night. We were kindly received, according to the hospitable traditions of the old-world monastic building, at the Colegio de Lluch.

July 6.—Before starting by the bridle-path for Pollensa we worked for about an hour in the broad valley near the building, and judging from this limited experience the locality appeared to provide better all-round collecting than any other place visited by us in the island.

When within a few miles of the ancient town a good deal of work was done in some flowery fields beside a stream. We arrived in time to visit Monte Sentuiri—a steep isolated hill which I had explored in 1900.

July 7.—This day was occupied in a walk to and from the Castillo del Rey. Many opportunities for good collecting were found in favourable spots by the path through the woods and here and there in the broad open valley beyond. Some of the mountain slopes near the ruined castle were clothed in a long coarse grass, all the more noticeable because of its scarcity in other places. Hopes, not destined to be fulfilled, were raised of the capture of Erebias.

July 8.—The day was occupied in a visit to the Port of Pollensa and in collecting on the low marshy ground, the Little Albufera, which borders the bay. Odonata were abundant by the irrigation ditches, and the flowers yielded a good harvest of insects. Much work was done in favourable spots by the side of the hot white road between Pollensa and its Port.

July 9.—The results of the 8th were so favourable, and the locality so different from any other we had visited, that it was determined to spend the last day at Pollensa at the Little Albufera. Much road-side collecting was done as on the 8th.

July 10.—We took the diligence to La Puebla and the train thence to Palma, arriving in time to spend the afternoon at Bellver Castle and the cliffs beyond Porto Pi as far as the 6th kilometre on the coast road, going over the ground explored on June 27.

July 11.—Up to this date there had been nothing but bright hot sun and cloudless skies. The change came on

the morning of the 11th, with a terrific downpour, which made us think that the weather had broken. In the afternoon, however, the sun shone as brightly as before, and we hastened to look for the insects which had been driven into cover by the dry heat of the previous days. We followed the route of the previous day, and Mr. Holland collected a fine assortment of species of *Blaps* under stones near Bellver Castle.

July 12.—On this, our last day in the island, we collected from the tram terminus at Porto Pi to the 6th kilometre on the coast road, returning in time to pack up and catch the boat which makes the night journey to Barcelona.

Reviewing the whole visit, it must be admitted that the weather was almost perfect, although a little more rain would probably have been advantageous. On the other hand, there can be no doubt that insects are far more abundant in species earlier in the summer. My visit to Majorca in the cold, cloudy and wet spring of 1900 was too early for the best results, ending as it did on April 4. Our visit in 1901 was too late. The withered remains of flowers in every direction gave some indication of favourable conditions which had passed away for the year, and although we searched for and found many of the late-blooming plants, it was obvious that these were very few as compared with the species whose flowering time was over. In spite of the poor weather the flowers were abundant and varied in March 1900, and included showy species which cover large areas, such as asphodel and various kinds of cistus. In the 1901 visit the flowers were generally of far less conspicuous kinds, and required to be sought for. I believe that May and the second half of April would be the best possible time for the entomologist in the Balearic Islands.

Sweeping was generally of little use, because of the hard prickly nature of the plants. Beating trees and shrubs in the evening was tolerably productive of the smaller moths.

In conclusion, it is a great pleasure to speak of the uniform kindness and hospitality of the people, and of their intense interest in the mysteries of the naturalist. Almost the whole population of the Port of Pollensa assembled to see us eat our simple lunch and look at the contents of the cyanide bottles; while at Pollensa an inquiry as to the Mallorquin names of insects produced a scene of wild excitement and dispute. Many an interesting and amus-

ing incident is recalled, and many a pleasant memory revived, by this attempt to write a brief account of our visit to Majorca.

EDWARD B. POULTON.

Oxford, July 9, 1904.

All the insects having been captured in 1901, *it has not been considered necessary to make further reference to the year. The captors are indicated by their initials, E. B. P., W. H., and A. H.*

CAMPONOTUS SICHELI, Mayr.

Little Albufera: *July* 9.—1 ☿ W. H.

CAMPONOTUS LATERALIS, Oliv., var.

Near Porto Pi: *July* 10.—1 ☿ W. H.

LASIUS NIGER, L.

Near Palma, Lluchmayor Road: *June* 28.—♂ and ♀ *in copulâ* A. H.
Soller Pass, below S. zigzags: *July* 1.—8 ♀ W. H.
Soller Pass, upper half of S. zigzags: *July* 1.—13 ☿ A. H.
Soller to Port: *July* 4.—1 ♀ winged A. H.
Little Albufera: *July* 8.—3 ☿. *July* 9.—19 ☿ W. H.
Road from Pollensa to Port: *July* 9.—2 ☿ W. H.

ACANTHOLEPIS FRAUENFELDII, Mayr.

Castle Bellver, 250–400 ft.: *June* 26.—1 ☿ A. H.
Near Porto Pi: *June* 27.—4 ☿ A. H. *July* 12.—1 ☿ E. B. P., 1 ☿ A. H.

MONOMORIUM SALOMONIS, L.

Near Porto Pi: *July* 12.—6 ☿ A. H.
Soller Pass, below S. zigzags: *July* 1.—1 ☿ A. H.
Upper half of S. zigzags: *July* 1.—1 ☿ A. H.
Soller to Port: *July* 4.—1 ☿ E. B. P.

APHÆNOGASTER STRUCTOR, Latr. ☿.

Castle Bellver, 250–400 ft.: *June* 26.—1 ☿ W. H.
Near Porto Pi: *June* 27.—10 ☿ E. B. P., 13 ☿ W. H., 12 ☿ A. H.
Near Palma, Lluchmayor Road: *June* 28.—5 ☿ A. H.

Plain of Palma, road to Soller: *June* 29.—4 ☿ W. H.
Soller Pass: *June* 29.—1 ☿ W. H. *June* 30.—1 ☿ W. H.

Aphænogaster barbara, L.

Castle Bellver, 250–400 ft.: *June* 26.—1 ☿ W. H.
Little Albufera: *July* 8.—21 ☿ W. H.

Aphænogaster testaceopilosa, Luc.

Near Porto Pi: *July* 12.—6 ☿ A. H.

Pheidole megacephala, F.

Soller Pass: *June* 29.—1 ♀ E. B. P.
Base of Monte Sentuiri: *July* 6.—3 ♀ W. H.
Pollensa: *July* 6.—2 ♂, 2 ♀, 90 ☿ A. H.
Little Albufera: *July* 9.—1 ♀ W. H.

Cremastogaster sordidula, Nyl.

Little Albufera: *July* 9.—2 ☿ W. H.

Cremastogaster scutellaris, Oliv.

Near Porto Pi: *July* 11.—2 pairs *in copulâ*, 6 winged 2 wingless ♀ E. B. P.; 5 pairs *in copulâ*, 7 winged ♀ W. H.; 2 pairs *in copulâ*, 1 ♂, 15 ♀ (1 wingless), A. H.
Soller Pass, below S. zigzags: *July* 1.—1 ☿ A. H.
Soller Pass, upper half of zigzags: *July* 1.—1 ☿ A. H.
Soller Pass: *July* 2.—23 ☿ A. H.

Cremastogaster scutellaris, race læstrygon, Emery.

Castle Bellver, 250–400 ft.: *June* 26.—8 ☿ W. H., 5 ☿ A. H. *July* 11.—1 ☿ E. B. P., 1 ☿ A. H.
Near Porto Pi: *June* 27.—1 ☿ E. B. P., 1 ☿ W. H., 15 ☿ A. H. *July* 10.—6 ☿ E. B. P., 1 ☿ W. H. *July* 12.—1 ☿ W. H.
Soller Pass, upper half of zigzags: *July* 1.—1 ☿ A. H.

Mutilla partita, Klug.

Castle Bellver, 250–400 ft.: *June* 26.—2 ♂ A. H.
Near Porto Pi: *June* 27.—1 ♂ A. H. *July* 10.—1 ♂ E. B. P., 1 ♂ W. H.

MYRMOSA COGNATA, Cost.

Soller Pass: *June* 30.—1 ♂ E. B. P.

MYZINE TRIPUNCTATA, Rossi.

Little Albufera: *July* 8.—1 ♂ W. H., 6 ♂ A. H. *July* 9.—4 ♂ A. H.

MYZINE TRIPUNCTATA, var. NIGRIFRONS, Sm.

Near Porto Pi: *June* 27.—2 ♂ E. B. P., 1 ♂ A. H. *July* 12.—4 ♂ E. B. P., 3 ♂ W. H., 2 ♂ A. H. Probably a variety of the preceding with the clypeus black.

SCOLIA 4-PUNCTATA, F.

Abundant everywhere.

SCOLIA FLAVIFRONS, F.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ E. B. P., 1 ♂ W. H.
Near Porto Pi: *June* 27.—1 ♀ A. H.
Soller to Port: *July* 4.—1 ♂ A. H.
Road from Lluch to Pollensa: *July* 6.—3 ♂ A. H.
Little Albufera: *July* 9.—1 ♀ A. H.

POMPILUS (*Planiceps*) CASTOR, Kohl.

Near Porto Pi: *June* 27.—1 ♀ E. B. P.
Soller to Lluch: *July* 5.—1 ♂ A. H.

POMPILUS (*Pedinaspis*) OPERCULATUS, Klug.

Near Porto Pi: *June* 27.—3 ♀ E. B. P., 3 ♀ W. H., 1 ♂, 3 ♀ A. H. *July* 10.—1 ♂, 2 ♀ E. B. P., 4 ♀ W. H., 2 ♀ A. H. *July* 12.—4 ♀ E. B. P., 2 ♀ W. H., 2 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—2 ♀ E. B. P., 1 ♀ A. H.
Plain of Palma, road to Soller: *June* 29.—1 ♀ W. H.
Soller Pass: *June* 30.—2 ♂, 1 ♀ E. B. P. *July* 2.—1 ♀ W. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♂ A. H.
Above Soller Pass: *July* 3.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ A. H.

Road from Pollensa to Port: *July* 8.—1 ♂, 2 ♀ E. B. P., 5 ♀ W. H., 3 ♀ A. H. *July* 9.—1 ♀ E. B. P., 1 ♀ W. H., 3 ♀ A. H.
Castle Bellver, 250–400 ft.: *July* 11.—1 ♀ A. H.

Pompilus viaticus, L.

18 ♀, 9 ♂. *June* 28 to *July* 9.

[On July 3, above Soller Pass, a female of this species was found carrying a brown spider of very large size as compared with its captor. E. B. P.]

Pompilus chalybeatus, Schiödte.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ E. B. P.
Little Albufera: *July* 8.—2 ♀ E. B. P., 1 ♂ A. H. *July* 9.—1 ♂, 3 ♀ A. H.
Near Porto Pi: *July* 10.—1 ♂ E. B. P.

Pompilus unguicularis, Thoms., var. (?).

Plain of Palma, road to Soller: *June* 29.—1 ♂ A. H.
Near Porto Pi: *July* 12.—1 ♂ W. H.

Pompilus, sp. (?).

Above Soller Pass: *July* 3.—1 ♂ W. H.

Pompilus, sp. (?).

Near Porto Pi: *July* 10.—1 ♀ W. H., 1 ♀ A. H. *July* 12.—1 ♀ E. B. P.

Pompilus effodiens, Fert.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ A. H.
Near Porto Pi: *July* 12.—1 ♀ W. H.
Road from Pollensa to Port: *July* 8.—1 ♀ A. H.

Pompilus rufipes, L.

Soller Pass: *June* 30.—1 ♂ E. B. P.
Above Soller Pass: *July* 3.—1 ♂ W. H.

Pompilus coccineipes, E. Saund.

Plain of Palma, road to Soller: *June* 29.—1 ♀ A. H.

Described from Algerian specimens. I have not seen it from any other localities.

Pompilus poultoni, sp. nov.

Niger, capite thoraceque aureopubescentibus, mandibularum apicibus, abdomine toto, femoribus tibiisque posticis rufis ; pronoto

postice margine angulatim emarginato, late pallido, metatarsis anticis 4 spinosis, unguiculis simplicibus.

♀. Black, apex of the mandibles, entire abdomen, posterior femora and tibiæ except at their bases and apices red, pronotum angularly emarginate at the base, the margin widely pale, wings with three submarginal cells.

♂ colour paler than in the ♀, abdomen with the apex and underside of the basal segment and a spot on each side of the 2nd, apices of all the femora, the intermediate tibiæ and the anterior and posterior tibiæ on their under-sides testaceous, pronotum as in the ♀.

♀. Clypeus and the lower part of the face, especially at the sides and also behind the eyes, densely clothed with pale golden hairs, a similar pubescence covers the front of the pronotum, the pleuræ, the coxæ, the extreme base of the mesonotum, the sides of the scutellum and post-scutellum, and the whole of the propodeum; vertex with a few erect hairs, pronotum at the base sharply emarginate, its actual margin membranous, the pale band very narrowly and deeply sinuate in the centre, wings dusky with a darker apical band, 3rd submarginal cell triangular, in the wing of one specimen with a slight petiole; propodeum widely channelled down the centre, its surface very finely microscopically reticulate. Comb of anterior metatarsus with 4 short spines, claws simple throughout, 4th and 5th joints of posterior tarsi subequal.

Long. 7·8 m.m.

The ♂ which I have associated with this ♀ is exactly similar in the form of the prothoracic emargination and pale band, but is much worn, so that most of the pubescence has probably been lost; the 3rd submarginal cell of the wings is trapezoidal; the inner posterior calcar is four-fifths as long as the metatarsus; abdomen compressed laterally, but unfortunately in the only specimen captured the terminal segments are "telescoped" up, so that I cannot get a good view of their shapes.

Long. 5–6 m.m.

Soller Pass: *June* 30.—1 ♀ W. H. *July* 3.—1 ♂ A. H. Above Pass.
Soller to Lluch: *July* 5.—1 ♂ W. H.
Castle Bellver, 250–400 ft.: *July* 11.—1 ♂ E. B. P.

POMPILUS CINGULATUS, Rossi.

Near Porti Pi: *June* 27.—2 ♀ E. B. P. *July* 12.—2 ♀ E. B. P., 2 ♀ W. H.

Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H.
Soller Pass: *June* 30.—1 ♀ W. H.
Soller Pass, upper half of S. zigzags: *July* 1.—2 ♀ A. H.
Above Soller Pass: *July* 3.—1 ♂ W. H.
Soller to Lluch: *July* 5.—1 ♀ W. H., 2 ♀ A. H.
Road from Pollensa to Port: *July* 9.—1 ♀ E. B. P.

Pompilus apicalis, V. de L.

Soller Pass: *June* 29.—1 ♀ W. H.
Soller to Lluch: *July* 5.—1 ♀ A. H.
Base of Monte Sentuiri: *July* 6.—1 ♀ A. H.

Pompilus niger, F.

Little Albufera: *July* 8.—1 ♂, 2 ♀ A. H. *July* 9.—2 ♂ E. B. P.

Pompilus approximatus, Sm.

Soller to Lluch: *July* 5.—1 ♀ A. H.
Little Albufera: *July* 9.—1 ♀ A. H.

Pompilus holomelas, Cost.

Soller Pass, upper half of S. zigzags: *July* 1.—2 ♀ A. H.
Above Soller Pass: *July* 3.—1 ♀ E. B. P.

Salius bisdecoratus, Cost.

Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P.
Road from Pollensa to Port: *July* 8.—2 ♂, 3 ♀ E. B. P., 3 ♂, 2 ♀ W. H., 2 ♂ A. H. *July* 9.—2 ♂, 7 ♀ E. B. P., 2 ♂, 8 ♀ W. H., 1 ♂, 8 ♀ A. H.
Little Albufera: *July* 8.—1 ♂ E. B. P., 1 ♂ A. H. *July* 9.—1 ♂ W. H., 1 ♀ A. H.

[The two pairs of yellow spots on the abdomen of the female of this species produce with the general colouring and shape a remarkable superficial resemblance to the female of the excessively abundant *Scolia quadripunctata*. When at rest upon a flower the insects could only be distinguished by careful observation. The resemblance is doubtless synaposematic, like that which obtains between the South African *Scolia alaris* and the Diploptera. (Trans. Ent. Soc. Lond., 1902, pp. 527–529.) Mr. A. H. Hamm

first pointed out this interesting example of Müllerian mimicry to me, and we both subsequently noticed it on several occasions. E. B. P.]

SALIUS, sp. (?).

Soller Pass: *June* 30.—1 ♀ A. H.

SALIUS PUSILLUS, Schiödte.

Soller Pass, upper half of S. zigzags: *July* 1.—1 ♀ A. H.

SALIUS PROPINQUUS, Lep.

Above Soller Pass: *July* 3.—1 ♀ E. B. P.

PSEUDAGENIA ALBIFRONS, Dhl.

Soller to Lluch: *July* 5.—1 ♀ E. B. P.
Lluch: *July* 6.—1 ♀ A. H.

PSEUDAGENIA CARBONARIA, Scop.

Soller Pass: *June* 29.—1 ♂ A. H. *June* 30.—1 ♀ E. B. P.
Above Soller Pass: *July* 3.—1 ♀ W. H., 1 ♀ A. H.
Soller Pass: *July* 1.—1 ♀ E. B. P.
Upper half of S. zigzags: *July* 1.—1 ♀ W. H.

CEROPALES MACULATUS, F.

Soller Pass: *June* 30.—2 ♀ W. H.
Road from Lluch to Pollensa: *July* 6.—1 ♀ W. H.
Little Albufera: *July* 8:—1 ♀ W. H. *July* 9.—1 ♀ A. H.

ASTATA BOOPS, Schr.

Soller Pass: *June* 30.—1 ♂ W. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ E. B. P., 1 ♀ A. H.

NOTOGONIA POMPILIFORMIS, Pz.

Soller Pass: *June* 30.—1 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♀ A. H. *July* 9.—1 ♀ E. B. P.

TACHYSPHEX NITIDUS, Spin.

Near Porto Pi: *June* 27.—1 ♀ E. B. P.
Plain of Palma, road to Soller: *June* 29.—1 ♂ E. B. P.

Little Albufera: *July* 8.—1 ♀ A. H. *July* 9.—1 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♀ W. H., 2 ♀ A. H. *July* 9.—1 ♀ A. H.
Near Porto Pi: *July* 12.—1 ♀ E. B. P.

Some of these specimens differ considerably from others by the wide, smooth, almost impunctate space just above the anterior margin of the clypeus. I sent one of these to Prof. Kohl of Vienna, but he considers it merely as a variety of this species.

Tachysphex, sp. (?) nr. *nitidus*.

Castillo del Rey: *July* 7.—1 ♀ A. H.

Puncturation of mesonotum finer and closer than in *nitidus*.

Tachysphex filicornis, Kohl.

Near Porto Pi: *July* 10.—1 ♂ W. H., 1 ♀ A. H. *July* 12.—1 ♀ W. H.

Trypoxylon attenuatum, Sm.

Above Soller Pass: *July* 3.—1 ♂ A. H.
Pollensa Castillo del Rey: *July* 7.—1 ♀ A. H.
Near Porto Pi: *July* 12.—1 ♂ E. B. P.

Psammophila hirsuta, Scop.

32 ♂, 12 ♀. *June* 26 to *July* 10.

Psammophila tydei, Guill.

Near Porto Pi: *June* 27.—1 ♂ W. H. *July* 10.—1 ♂ A. H. *July* 12.—2 ♂ E. B. P., 2 ♂ W. H., 1 ♂, 1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂, 1 ♀ E. B. P., 2 ♂, 2 ♀ A. H.
Soller to Port: *July* 4.—1 ♂, 1 ♀ E. B. P.
Road from Pollensa to Port: *July* 8.—1 ♀ A. H.
Little Albufera: *July* 8.—1 ♂ E. B. P., 1 ♂ W. H., 2 ♀ A. H. *July* 9.—1 ♂, 2 ♀ E. B. P., 1 ♂ A. H.

Sphex viduatus, Chr.

Near Porto Pi: *June* 27.—1 ♀ E. B. P. *July* 12.—1 ♂ E. B. P., 1 ♂ W. H.

This is far from being a common species, but occurs in Algeria and S. Europe.

SPHEX SUBFUSCATUS, Dhl.

Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P.
Above Soller Pass: *July* 3.—1 ♂ A. H.
Soller to Port: *July* 4.—1 ♂ A. H.
Road from Pollensa to Port: *July* 9.—1 ♀ W. H.
Castle Bellver, 400 ft.: *July* 11.—1 ♂ E B. P.

SPHEX FLAVIPENNIS, F.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ A. H.
Soller Pass: *June* 30.—1 ♂ E. B. P. *July* 1.—1 ♀ E. B. P. *July* 2.—1 ♂, 1 ♀ A. H.
Above Soller Pass: *July* 3.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♀ E. B. P.

SCELIPHRON PENSILIS, Ltr.

Lluch: *July* 6.— 1 ♂ A. H.
Lluch to Pollensa: *July* 6.—1 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ W. H., 2 ♀ A. H.
Pollensa to Port: *July* 8.—1 ♀ E. B. P. *July* 9.—1 ♂ E. B. P.
Near Porto Pi: *July* 12.—1 ♂ W. H.

SCELIPHRON SPIRIFEX, L. Common.

[Wherever mud was found these insects were seen collecting it for making their nests.

Both this species and the preceding, which is indistinguishable from it on the wing, present a very peculiar appearance during flight. The pale yellow parts of body and legs become invisible, while the black areas are extremely conspicuous. The limbs are probably so held during the flight of the insect that their yellow sections come beneath the median yellow of the body. However this may be the terminal black parts seem to be completely detached, suggesting the appearance of two insects, one pursuing the other, or a predaceous species carrying its prey. E. B. P.]

MIMESA PALLIDITARSIS, sp. nov.

Nigra, palpis, tibiarum posticarum basibus, tarsis-que omnibus flavis, capite thoraceque plus minus dense punctatis, antennarum articulis subtus valde carinatis, abdominis petiolo carinato, postpetiolo longiore.

♂. Black; the palpi, the extreme apex of all the tibiæ, the base of the posterior pair and all the calcaria and tarsi pale, the extreme apices of the femora pitchy, face densely clothed with silvery hairs with a slight golden tinge, vertex very densely and closely punctured, joints of the flagellum strongly carinated beneath, scape swollen, about equal in length to the 2nd joint of the flagellum, mesonotum shining, clothed with a sparse grey pubescence, deeply and somewhat closely punctured, the puncturation very close in front, less so on the disc and sides, where in certain positions indications of longitudinal rugosities can be seen, post-scutellum exceedingly finely and closely punctured, mesopleuræ finely punctured, sides of the metapleuræ and propodeum diagonally striate, propodeum above largely reticulate, its basal area very shining with a few large somewhat radiating costæ, wings slightly dusky, tegulæ and nervures piceous, legs sparingly clothed with greyish hairs; petiole of the basal segment of the abdomen longer than the post-petiole, clothed with long erect grey hairs, central keel slightly widening near its base, rest of the abdomen shining, finely and remotely punctured, clothed with very short greyish hairs, which are more conspicuous on the apices of the segments laterally; apical process of 8th segment testaceous.

Long. 7·8 mm.

Little Albufera: *July* 9.—1 ♂ E. B. P., 1 ♂ W. H., 2 ♂ A. H.

Pemphredon shuckardi, Mor.

Little Albufera: *July* 9.—1 ♂ W. H.

Pemphredon lethifer, Shuck.

Soller Pass: *July* 2.—1 ♀ A. H.
Little Albufera: *July* 9.—1 ♀ A. H.

Diodontus friesei, Kohl.

Near Palma, Lluchmayor Road: *June* 28.—1 ♂ A. H., 1 ♂ E. B. P.

Described from specimens from Palestine. Prof. Kohl has seen one of the specimens, and agrees in considering it as belonging to this species.

Diodontus minutus, Fab.

Near Porto Pi: *July* 10.—1 ♀ E. B. P.

Passalœcus insignis, V. de L.

Road from Pollensa to Port: *July* 8.—1 ♂ A. H.

GORYTES LÆVIS, Ltr.

Soller Pass: *June* 30.—1 ♀ W. H.
Near Porto Pi: *July* 12.—1 ♀ E. B. P.

GORYTES LATIFRONS, Spin.

Soller to Lluch: *July* 5.—1 ♀ A. H.

BEMBEX OCULATA, Ltr.

Near Porto Pi: *July* 10.—1 ♀ E. B. P., 1 ♂ A. H. *July* 12.—4 ♂ E. B. P., 1 ♀ W. H., 1 ♀ A. H.

[Flying very rapidly over the wet sand at the bottom of the little inlet. E. B. P.]

STIZUS TRIDENS, F.

Near Porto Pi: *June* 27.—1 ♂ A. H. *July* 12.—1 ♂ E. B. P., 1 ♀ A. H.
Soller to Port: *July* 4.—2 ♂ A. H.

PHILANTHUS TRIANGULUM, F.

June 26 to *July* 11.—49 ♂, 45 ♀.

[The females were often seen carrying bees to their nest, especially at Soller Pass, where a colony had excavated burrows in a heap of road scrapings. E. B. P.]

CERCERIS ARENARIA, L.

Abundant.

CERCERIS 4-CINCTA, V. de L.

Near Porto Pi: *June* 27.—3 ♂ E. B. P., 1 ♂ W. H. *July* 10.—1 ♀ A. H. *July* 12.—4 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—2 ♂ E. B. P., 5 ♂, 1 ♀ A. H.
Plain of Palma, road to Soller: *June* 29.—2 ♀ A. H.
Soller Pass: *June* 30.—1 ♂, 1 ♀ E. B. P. *July* 2.—3 ♂ W. H., 1 ♀ A. H., 1 ♂ E. B. P. Upper half of S. zigzags: *July* 1.—1 ♀ E. B. P., 5 ♂ A. H. Below S. zigzags: *July* 1.—1 ♂ W. H.
Soller to Lluch: *July* 5.—1 ♀ E. B. P.
Lluch: *July* 6.—1 ♂, 1 ♀ E. B. P.
Road from Lluch to Pollensa: *July* 6.—1 ♂ A. H.

Pollensa to Castillo del Rey: *July* 7.—1 ♂ E. B. P.
Road from Pollensa to Port: *July* 8.—1 ♂ E. B. P.
Castle Bellver: *July* 11.—2 ♂ A. H.

Cerceris ferreri, V. de L.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ E. B. P.
Near Porto Pi: *June* 27.—1 ♂ E. B. P., 2 ♂, 1 ♀ A. H.
Near Palma Lluchmayor Road: *June* 28.—1 ♂ A. H.
Soller Pass: *June* 30.—3 ♂, 2 ♀ E. B. P. *July* 1.—1 ♀ E. B. P. *July* 2.—1 ♂ A. H.
Soller Pass, upper half S. zigzags: *July* 1.—1 ♂ A. H.
Above Soller Pass: *July* 3.—1 ♀ A. H.
Soller to Port: *July* 4.—1 ♂ A. H.
Little Albufera: *July* 8.—1 ♀ E. B. P., 1 ♀ A. H.

Cerceris emarginata, Pz.

♂ and ♀ common.

Oxybelus lamellatus, Oliv.

Little Albufera: *July* 9.—1 ♀ W. H.

Crabro hypsæ, de Stef. ♀, *punctatus*, H.-Sch. (nec Lep.?).

Soller to Lluch: *July* 5.—1 ♀ A. H.
Road from Pollensa to Port: *July* 9.—1 ♀ W. H.
Near Porto Pi: *July* 10.—1 ♀ B. P.

For this determination I am indebted to Prof. Kohl, who tells me that it is certainly *hypsæ* of de Stefani, and certainly *punctatus*, H.-Schaeffer, but that it is doubtful if it is the *punctatus* of Lepeletier.

Crabro vagus, L., var. *sulphuripes*, Sm.

Plain of Palma, road to Soller: *June* 29.—3 ♂, 1 ♀ A. H., 1 ♂ W. H.
Soller Pass: *June* 30.—2 ♂ W. H. *July* 2.—2 ♂ W. H. Upper half of S. zigzags: *July* 1.—1 ♂ W. H. Below S. zigzags: *July* 1.—1 ♂ W. H.
Little Albufera: *July* 9.—1 ♂ E. B. P., 1 ♂ W. H.

Crabro elongatulus, V. de L., var. *femoribus anticis subtus barbatis.*

Near Palma, Lluchmayor Road: *June* 28.—2 ♂, 1 ♀ E. B. P., 1 ♂, 2 ♀ A. H.

CRABRO 5-NOTATUS, Jur.

Soller to Lluch: *July* 5.—2 ♀ A. H.

VESPA GERMANICA, F.

Soller Pass: *June* 30.—1 ♀ W. H. *July* 1.—1 ♀ E. B. P.
Above Soller Pass: *July* 2.—1 ♀ E. B. P.
Soller to Port: *July* 4.—1 ♀ E. B. P.

[The rarity of this species was noteworthy. Only females were seen. E. B. P.]

POLISTES GALLICA, L.

Abundant everywhere.

[After *Halictus scabiosæ*, this was the most abundant Aculeate in the island. E. B. P.]

EUMENES COARCTATA, L.

Fairly abundant everywhere.

RHYNCHIUM OCULATUM, F.

Soller to Port: *July* 4.—1 ♂ E. B. P., 1 ♂ A. H.
Pollensa, on vine behind Fonda: *July* 7.—1 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♂ W. H., 2 ♂, 2 ♀ A. H.
Little Albufera: *July* 9.—1 ♀ A. H.

ODYNERUS DANTICI, Rossi, var.

Near Porto Pi: *June* 27.—1 ♂ E. B. P., 1 ♂ A. H. *July* 10.—1 ♂ W. H. *July* 12.—1 ♂, 2 ♀ E. B. P., 3 ♂ W. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂, 1 ♀ E. B. P., 1 ♀ A. H.
Soller Pass: *June* 30.—1 ♂ E. B. P., 1 ♂ W. H. *July* 2.—1 ♂ A. H.
Little Albufera: *July* 8.—2 ♀ E. B. P.

A rather small form of this very variable species.

ODYNERUS SIMPLEX, F.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ W. H.
Soller Pass, below S. zigzags: *July* 1.—1 ♀ E. B. P., 1 ♂ A. H.
Road from Lluch to Pollensa: *July* 6.—1 ♂ A. H.
Road from Pollensa to Port: *July* 8.—1 ♀ W. H., 1 ♀ A. H. *July* 9.—1 ♀ A. H.

Odynerus parietum, Linn.

Abundant.

Odynerus parietum, Linn., var. *renimacula*.

Soller Pass: *June* 30.—1 ♀ A. H. Upper half of S. zigzags: *July* 1.—1 ♀ A. H. Below S. zigzags: *July* 1.—3 ♀ E. B. P., 1 ♀ W. H. Above Soller Pass: *July* 3.—1 ♂ W. H.

[This variety was thus, within the limits of our experience, confined to the vicinity of Soller Pass. E. B. P.]

Odynerus alpestris, Sauss.

Castle Bellver, 250–400 ft.: *June* 26.—2 ♀ A. H.
Near Porto Pi: *June* 27.—2 ♀ W. H., 2 ♀ A. H. *July* 10.—2 ♂, 2 ♀ E. B. P., 3 ♀ A. H. *July* 12.—2 ♂, 3 ♀ E. B. P., 2 ♂, 3 ♀ W. H., 2 ♂, 2 ♀ A. H.

Odynerus siculus, de Stef. (?).

Road from Pollensa to Port: *July* 8.—1 ♂ E. B. P. *July* 9.—1 ♀ A. H.
Near Porto Pi: *July* 10.—1 ♂ A. H. *July* 12.—1 ♀ E. B. P., 1 ♂ W. H., 3 ♂, 1 ♀ A. H.
Castle Bellver, 250–400 ft.: *July* 11.—1 ♂ A. H.

Prosopis variegata, F.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂, 2 ♀ E. B. P., 2 ♂, 6 ♀ W. H., 1 ♀ A. H. *July* 11.—1 ♀ W. H., 1 ♂, 1 ♀ A. H.
Near Porto Pi: *June* 27.—1 ♂ E. B. P., 2 ♂, 2 ♀ A. H. *July* 11.—1 ♀ W. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P.
Base of Monte Sentuiri: *July* 6.—1 ♀ A. H.

Prosopis masoni, Ed. Saund.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ E. B. P., 1 ♂ A. H.
Near Porto Pi: *June* 27.—1 ♂ A. H. *July* 12.—1 ♂, 1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P.
Soller Pass: *June* 30.—1 ♀ E. B. P.
Above Soller Pass: *July* 3.—1 ♀ E. B. P.

Lluch: *July* 6.—1 ♀ W. H.
Road from Lluch to Pollensa: *July* 6.—1 ♂ E. B. P., 2 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♂, 1 ♀ E. B. P., 2 ♂, 7 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♂ W. H.

PROSOPIS PICTA, Sm.

Soller Pass: *June* 30.—1 ♀ W. H.
Soller to Port: *July* 4.—1 ♂ E. B. P., 1 ♂ A. H.
Soller to Lluch: *July* 5.—1 ♀ E. B. P.
Little Albufera: *July* 9.—1 ♂ W. H.

PROSOPIS CLYPEARIS, Schenck.

Near Porto Pi: *June* 27.—1 ♂ A. H. *July* 12.—1 ♀ A. H.
Soller to Lluch: *July* 5.—1 ♂ W. H., 2 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ E. B. P., 2 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♀ W. H.

PROSOPIS PICTIPES, Nyl.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ W. H.
Soller Pass: *June* 30.—1 ♀ A. H.
Near Porto Pi: *July* 12.—1 ♂ E. B. P.

PROSOPIS IMPARILIS, Först.

Road from Lluch to Pollensa: *July* 6.—1 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♂ E. B. P., 2 ♂ A. H.

SPHECODES GIBBUS, L., var.

Palma, Road to Lluchmayor: *June* 28.—4 ♂ E. B. P., 1 ♂ 1 ♀ A. H.
Soller Pass: *June* 29.—1 ♂ W. H. *June* 30.—2 ♂ A. H. *July* 1.—1 ♀ E. B. P. *July* 2.—1 ♂ A. H.
Above Soller Pass: *July* 3.—1 ♂ A. H.
Soller to Port: *July* 4.—2 ♂ A. H.
Soller to Lluch: *July* 5.—1 ♂ W. H., 1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♂ A. H.
Near Porto Pi: *July* 10.—1 ♂ A. H. *July* 12.—2 ♂ E. B. P., 5 ♂ W. H.

In all the specimens the abdomen is entirely red, and the posterior tibiæ red in both sexes. The armature, however, is that of typical *gibbus*.

Sphecodes subquadratus, Sm.

Common.

Sphecodes puncticeps, Thoms.

Near Porto Pi: *June* 27.—1 ♂ A. H. *July* 12.—1 ♂ E. B. P.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♀ E. B. P.
Pollensa to Castillo del Rey: *July* 7.—1 ♂ A. H.
Road from Pollensa to Port: *July* 9.—1 ♂ A. H.

Halictus scabiosæ, Rossi, ♂ ♀, and var. *ochraceovittatus*, Dours.

Abundant everywhere.

The majority of the ♂♂ belong to the smaller form, which I believe to be identical with *ochraceovittatus*, Dours.

[This was by far the most abundant Aculeate in the island. E. B. P.]

Halictus separandus, Schm.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ E. B. P., 1 ♀ W. H., 1 ♂ A. H.
Near Porto Pi: *June* 27.—1 ♀ E. B. P. *July* 10.—1 ♂ E. B. P. *July* 12.—1 ♀ W. H., 1 ♂ A. H.
Near Palma, Lluchmayor Road: *June* 28.—2 ♂ A. H.
Lluch: *July* 6.—1 ♂ A. H.

Halictus malachurus, Kirb.

Abundant.

Halictus villosulus, Kirb.

Pollensa to Castillo del Rey: *July* 7.—3 ♂ E. B. P.
Near Porto Pi: *July* 12.—1 ♂ E. B. P.

Halictus brevicornis, Schk.

Soller Pass, upper half of S. zigzags: *July* 1.—1 ♀ E. B. P.
Soller Pass: *July* 2.—1 ♀ A. H.
Above Soller Pass: *July* 3.—2 ♀ A. H.

Soller to Lluch: *July* 5.—1 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♀ A. H.

These specimens are slightly different from those of this species which occur further north, in having the punctuation of the mesonotum stronger and more regular.

HALICTUS PUNCTATISSIMUS, Mor.

Near Porto Pi: *June* 27.—1 ♂ E. B. P.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂ A. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♂ A. H.
Soller to Lluch: *July* 5.—1 ♂ A. H.

HALICTUS DUBITABILIS, sp. nov.

H. punctatissimo affinis, sed multo minor, ♂ capite valde elongato clypeo minus producto, antennis pallidis, ♀ capite breviore clypeo minus producto, propodeo nitidiore striis basalibus brevioribus, distinctus.

♂. Face very elongate, about twice as long as its greatest width between the eyes, antennæ long, reaching, when the head is in a horizontal position, to about the apex of the propodeum, the joints of the flagellum longer than wide, slightly swollen beneath, testaceous and scarcely black even posteriorly. Mesonotum nearly dull, closely punctured propodeal area radiately rugose, wing nervures and tegulæ pale testaceous, legs clothed with greyish-white hairs, abdomen slightly shining closely and distinctly punctured on the 1st and 2nd segments, indefinitely on the rest, beneath with a few longish hairs on the discs of the segments.

♀ exceedingly like a diminutive *punctatissimus* but the face is rather shorter, the clypeus not being so much produced; the mesonotum is duller and rather more closely punctured, the propodeum more shining with more regular and shorter longitudinal striæ at the base, beyond which the brow is smooth and shining, its apical margin subtruncate, abdomen punctured much as in *punctatissimus*.

Long. 5 m.m.

A species with the general facies of *punctatissimus* but much smaller, black, clothed sparingly with greyish-white hairs, the ♂ with the antennæ beneath, the apex of the clypeus, the labrum, mandibles, the tibiæ at their base and apex and the tarsi pale testaceous.

Near Palma, Lluchmayor Road: *June* 28.—2 ♂ A. H.
Road from Lluch to Pollensa: *July* 6.—1 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—3 ♀ A. H.
Road from Pollensa to Port: *July* 8.—9 ♂ E. B. P., 1 ♂ W. H., 4 ♂ 1 ♀ A. H.
Little Albufera: *July* 8.—1 ♀ W. H., 1 ♀ A. H. *July* 9.—1 ♂ 1 ♀ W. H., 1 ♀ E. B. P.
Near Porto Pi: *July* 10.—1 ♂ W. H. *July* 12.—2 ♂ A. H.

HALICTUS HOLLANDI, sp. nov.

H. minutissimo affinis, facie longiore, mesonoto minus dense punctato nitidiore, antice linea longitudinali breviore minus fortiter impressa, abdominis segmento basali punctato, distinguendus.

♂ black, apex of clypeus, labrum and mandibles flavous, antennæ beneath, tegulæ and the base of the tibiæ pale, tarsi more or less piceous, head rather shining, strongly punctured, face rather elongate, clothed with white pubescence, clypeus scarcely produced, antennæ somewhat thick, the joints slightly swollen. Mesonotum shining, seen under a strong lens to be microscopically rugulose, not closely but distinctly and rather finely punctured, propodeum rounded posteriorly its brow rather callous and shining, basal area impressed and irregularly and longitudinally rugose, wings hyaline, nervures brown, legs clothed with white hairs; abdomen shining, sparingly clothed, especially at the sides and apex, with short white hairs. Apices of the 1st and 2nd segments very deeply impressed, making the segments very convex, in this respect much resembling *minutissimus*. Puncturation fine and even on the 1st and 2nd, more confused and irregular on the rest of the segments, there is a slight trace of a white pubescent basal band on the 2nd.

♀ sub-elongate and very like *minutissimus* in general shape, entirely black, sparingly clothed with white hairs, face rather elongate, more or less approaching the form of *punctatissimus*, etc., face dull very closely punctured, vertex shining and less closely so, clypeus largely punctured, but scarcely shining, mesonotum shining, with a distinct and well-defined puncturation on a finely rugulose surface, a well-marked central impression in front, propodeum, etc., as in the ♂, legs clothed with long white hairs, abdomen with the apices of the segments paler, basal segment very shining, finely and remotely punctured, the rest duller and closely so, 2nd segment with a very slight indication of a lateral white pubescent spot at the base.

Long. 4–4½ m.m.

Closely allied to *minutissimus*, but with a longer face, more shining and rather less closely punctured mesonotum, the central impression of which is shorter and less deep, and with the basal segment of the abdomen punctured; the propodeum also is narrower and its sides more convergent.

I have named this species in honour of Mr. W. Holland, who has done so much excellent work on the British insect fauna, and especially the Coleoptera.

Road from Pollensa to Port: *July* 8.—2 ♂ E. B. P.
Little Albufera: *July* 9.—4 ♀ E. B. P., 2 ♂ W. H.

HALICTUS MUCOREUS, Ev.

MALES.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂ W. H.
Near Porto Pi: *June* 27.—1 ♂ E. B. P., 2 ♂ W. H. *July* 10.—4 ♂ E. B. P., 3 ♂ W. H., 7 ♂ A. H. *July* 11.—1 ♂ E. B. P. *July* 12.—2 ♂ W. H.

FEMALES.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ E. B. P., 2 ♀ W. H. *July* 11.—2 ♀ A. H.
Near Porto Pi: *June* 27.—5 ♀ E. B. P., 5 ♀ W. H., 9 ♀ A. H. *July* 10.—3 ♀ E. B. P., 6 ♀ W. H., 3 ♀ A. H. *July* 12.—2 ♀ E. B. P., 4 ♀. W. H., 9 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H.
Plain of Palma, Road to Soller: *June* 29.—1 ♀ E. B. P.
Above Soller Pass: *July* 3.—1 ♀ W. H.

HALICTUS PULVEREUS, Mor.

Near Porto Pi: *July* 10.—1 ♂ A. H. *July* 11.—1 ♂ W. H. *July* 12.—1 ♀ A. H.
Castle Bellver, 250–400 ft.: *July* 11.—2 ♂ E. B. P., 5 ♂, 1 ♀ A. H.

HALICTUS GEMMEUS, Dours.

9 ♂, 170 ♀. Fairly common everywhere.

HALICTUS HAMMI, sp. nov.

Æneo-viridis, nitidus, segmentorum abdominis apicibus testaceis Maris caput maximum clypei apice, tibiarum basi et apice tarsisque totis flavis, propodei area subtriangulari longitudinaliter rugosa.

Bronzy-green, sparingly clothed with white hairs, legs and antennæ black, apical margin of the abdominal segments widely pale in the ♀ narrowly in the ♂, in which latter sex a spot at the apex of the clypeus, the base and apex of the tibæ and all the tarsi, except their apical joints, are pale yellowish white.

♂ head very large, wider considerably than the thorax, dull, and very finely and closely punctured, face across the eyes longer than wide, cheeks somewhat angularly produced above the base of the mandibles, clypeus and centre of face below the antennæ shining and more largely punctured, with a yellow spot at the apex, the colour extending a little backwards in a central line. Eyes scarcely converging, antennæ black, the joints slightly swollen beneath, those of the flagellum beyond the 3rd, about once and a quarter as long as wide; mesonotum shining, closely punctured but much less so than the head, tegulæ pale, wings hyaline with brown nervures, the stigma paler, propodeum with a well-defined subtriangular basal area, which is irregularly and longitudinally rugose, sides of the propodeum rugosely punctured; abdomen very shining, not very closely punctured, the 2nd and 3rd segments with a basal patch of white pubescence on each side, the 1st and 2nd rather deeply impressed at the apex laterally, apices of the segments beneath simple, widely pale, the 6th, at any rate as much as is visible in this specimen, testaceous, legs clothed with short white hairs.

♀ in sculpture resembling the ♂, eyes more convergent, pale bands at the apices of the segments very broad, the apical rima and sides of the 5th segment also pale, 2nd and 3rd segments with lateral white pubescent spots at the base as in the ♂, 4th with a continuous band, tibiæ narrowly paler at the base and apex, 2nd segment beneath with very long pale hairs.

Long. 5·6 m.m.

Allied to *Smeathmanellus* but differing in the pale tarsi, etc., of the ♂ and the puncturation and pale apical margins of the segments in the ♀. It is also closely allied to *simulans*, Perez, but the propodeal area is striate or vaguely so, and the apices of the abdominal segments are not punctate as they are said to be in that species.

This species is named in honour of Mr. A. H. Hamm, who has done so much in collecting and observing the British Aculeate Hymenoptera.

Soller Pass, zigzags to Soller: *July* 4.—1 ♂, 1 ♀ A. H.
Soller to Port: *July* 4.—1 ♀ A. H.

Soller to Lluch: *July* 5.—1 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ E. B. P.

HALICTUS SPHECODIMORPHUS, Vach.

Soller Pass: *June* 30.—1 ♀ W. H.

NOMIOIDES PULCHELLA, Schk.

Near Porto Pi: *June* 27.—1 ♂ W. H., 5 ♂ A. H. *July* 10.—4 ♂ E. B. P., 9 ♂, 1 ♀ A. H. *July* 12.—1 ♀ E. B. P., 5 ♂, 6 ♀ A. H.
Castle Bellver, 250–400 ft.: *July* 11.—10 ♂, 1 ♀ A. H.

NOMIOIDES VARIEGATA, Oliv.

Near Porto Pi: *July* 10.—1 ♀ E. B. P., 1 ♀ A. H. *July* 12.—6 ♀ A. H.

ANDRENA MORIO, Brullé.

Bellver Castle, 250–400 ft.: *June* 26.—1 ♀ W. H.
Near Porto Pi: *June* 27.—1 ♀ E. B. P.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P., 1 ♂ A. H.
Soller Pass: *June* 30.—1 ♀ E. B. P. *July* 2.—1 ♀ A. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♂ W. H.

ANDRENA BOYERELLA, Dours. (?).

Above Soller Pass: *July* 3.—1 ♀ W. H.
Soller to Lluch: *July* 5.—2 ♀ W. H.

ANDRENA FULVICRUS, Kirb.

Castle Bellver, 250–400 ft.: *June* 26.—2 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—2 ♂ E. B. P.
Above Soller Pass: *July* 3.—1 ♀ A. H.

ANDRENA, sp. (?). Allied to *minutula*.

Pollensa to Castillo del Rey: *July* 7.—2 ♂ A. H.

ANDRENA ALBOFASCIATA, Thoms. (?).

Near Porto Pi: *June* 27.—1 ♀ E. B. P.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂, 1 ♀ E. B. P., 3 ♀ A. H.

Soller Pass: *June* 29.—1 ♀ W. H., 4 ♀ A. H. *June* 30.—5 ♀ E. B. P., 1 ♂ W. H., 1 ♀ A. H. *July* 2.—1 ♀ W. H., 1 ♂, 5 ♀ A. H. *July* 4.—5 ♂, 12 ♀ E. B. P.
Soller Pass, upper half of S. zigzags: *July* 1.—2 ♀ E. B. P., 8 ♀ W. H., 2 ♂, 5 ♀ A. H.
Above Soller Pass: *July* 2.—2 ♀ E. B. P. *July* 3.—1 ♀ E. B. P., 4 ♀ A. H.
Soller to Port: *July* 4.—1 ♂ A. H.
Soller to Lluch: *July* 5.—1 ♀ A. H.
Lluch: *July* 6.—1 ♀ E. B. P.
Road from Lluch to Pollensa: *July* 6.—1 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—3 ♂, 1 ♀ E. B. P.

These are all, I believe, referable to what Schmiedeknecht describes as Thomson's species, and he mentions the Balearic Isles as a locality from which he has received it; probably it may be only a white-haired form of *Afzeliella*.

Nomia ruficornis, Luc.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♂, 1 ♀ W. H. *July* 11.—1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂ E. B. P.
Road from Luch to Pollensa: *July* 6.—1 ♂ A. H.
Near Porto Pi: *July* 12.—1 ♂ W. H.

Nomada mephisto, Sch., ♀.

Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H.

A fine, rare species.

Pasites maculatus, Jur.

Near Porto Pi: *June* 27.—1 ♀ A. H. *July* 12.—1 ♂ A. H.

Ceratina cucurbitina, Rossi.

Common. (All females.)

Ceratina parvula, Sm.

Road from Lluch to Pollensa: *July* 6.—1 ♀ A. H.

This is, I believe, the first record of this little species from the Balearic Isles. It was originally described from Albania.

CERATINA DALLATORREANA, Friese.

ALL FEMALES.

Near Porto Pi: *June* 27.—2 ♀ A. H. *July* 12.—1 ♀ E. B. P., 1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ E. B. P.
Lluch: *July* 6.—1 ♀ W. H., 1 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—2 ♀ W. H., 3 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ E. B. P.
Road from Pollensa to Port: *July* 8.—1 ♀ E. B. P., 5 ♀ W. H., 4 ♀ A. H. *July* 9.—2 ♀ E. B. P.

XYLOCOPA VIOLACEA, L.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ W. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♀ E. B. P.
Above Soller Pass: *July* 2.—1 ♂, 6 ♀ E. B. P. *July* 3.—1 ♀ E. B. P.
Soller Pass: *July* 4.—1 ♀ E. B. P.
Soller to Lluch: *July* 5.—3 ♀ W. H., 1 ♀ A. H.
Lluch: *July* 6.—3 ♀ E. B. P., 2 ♀ W. H.
Road from Lluch to Pollensa: *July* 6.—1 ♀ E. B. P., 1 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—4 ♀ W. H.
Little Albufera: *July* 9.—4 ♀ E. B. P.
Near Porto Pi: *July* 10.—1 ♀ A. H.

CŒLIOXYS AFRA, Lep.

Near Porto Pi: *June* 27.—1 ♀ A. H. *July* 12.—1 ♀ W. H.
Above Soller Pass: *July* 2.—1 ♂ E. B. P.
Soller to Port: *July* 4.—1 ♀ E. B. P.
Lluch: *July* 6.—1 ♂ W. H.
Pollensa to Castillo del Rey: *July* 7.—3 ♂ E. B. P., 1 ♂, 1 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♂ W. H. *July* 9.—1 ♂ W. H.
Castle Bellver, 250–400 ft.: *July* 11.—1 ♂ A. H.

CŒLIOXYS ACUMINATA, Nyl.

Pollensa to Castillo del Rey: *July* 7.—1 ♀ E. B. P.

Apical ventral valve with an unusually blunt apex.

Chalicodoma sicula, Rossi.

Road from Lluch to Pollensa: *July* 6.—3 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—3 ♀ E. B. P., 1 ♀ W. H.

[All specimens much worn. Both males and females of this species were very abundant and in beautiful condition at the end of March and beginning of April in 1900 (E. M. M., Sept. 1901, p. 210). Only a few very worn females were seen three months later in 1901. E. B. P.]

Megachile sericans, Fonsc.

Near Porto Pi. Extremely abundant July 10–12, although also seen earlier.
Near Palma, Lluchmayor Road: *June* 28.—2 ♀ E. B. P., 2 ♀ A. H.
Soller Pass: *June* 30.—1 ♂ E. B. P. Above Soller Pass: *July* 3.—1 ♀ W. H.
Soller to Lluch: *July* 5.—1 ♂ E. B. P.
Lluch: *July* 6.—1 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—3 ♂ E. B. P., 3 ♂, 1 ♀ W. H., 4 ♂ A. H.
Castle Bellver, 250–400 ft.: *July* 11.—1 ♂ E. B. P., 1 ♂ W. H.

[The female when she first alights on a flower raises and shakes her abdomen, exposing the red scopa and rendering it remarkably conspicuous. She stings very freely, and the display is probably aposematic. E. B. P.]

Megachile centuncularis, L.

Soller Pass: *June* 29.—1 ♀ A. H.
Little Albufera: *July* 9.—1 ♂ E. B. P.

Megachile argentata, Ltr.

Common.

Megachile rotundata, F.

Near Porto Pi: *June* 27.—1 ♀ E. B. P.
Road from Pollensa to Port: *July* 9.—1 ♀ W. H.

Megachile apicalis, Spin.

Frequent.

Anthidium manicatum, Ltr.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ E. B. P., 3 ♂, 3 ♀ W. H., 1 ♂, 2 ♀ A. H. *July* 11.—2 ♂, 4 ♀ E. B. P.

Near Porto Pi: *June* 27.—1 ♂, 1 ♀ W. H., 2 ♂ A. H. *July* 11.—1 ♀ W. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂, 1 ♀ E. B. P., 5 ♂, 4 ♀ A. H.
Lluch: *July* 6.—2 ♂, 2 ♀ W. H., 1 ♀ A. H.

ANTHIDIUM CINGULATUM, Ltr.

Common.

ANTHIDIUM FLORENTINUM, F.

Castle Bellver, 250–400 ft.: *June* 26.—2 ♂, 4 ♀ W. H.

ANTHIDIUM 7-DENTATUM, Ltr.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ E. B. P.
Soller Pass: *June* 29.—1 ♀ A. H. *June* 30.—1 ♀ W. H. *July* 2.—1 ♀ A. H.
Soller Pass, upper half of S. zigzags: *July* 1.—1 ♂ W. H., 1 ♂, 1 ♀ A. H.
Above Soller Pass: *July* 2.—1 ♂ E. B. P. *July* 3.—1 ♀ E. B. P., 1 ♀ W. H.
Soller to Lluch: *July* 5.—3 ♂ E. B. P.
Road from Lluch to Pollensa: *July* 6.—1 ♀ W. H.
Base of Monte Sentuiri: *July* 6.—1 ♂ W. H., 1 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ W. H., 1 ♀ A. H.
Near Porto Pi: *July* 11.—1 ♂ W. H.

ANTHIDIUM LITURATUM, Pz.

Road from Lluch to Pollensa: *July* 6.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—1 ♀ A. H.

ERIADES CRENULATUS, Nyl.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ A. H.
Near Porto Pi: *June* 27.—1 ♂ W. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♂ E. B. P., 3 ♀ A. H.
Lluch: *July* 6.—1 ♀ E. B. P., 1 ♀ W. H.
Road from Lluch to Pollensa: *July* 6.—1 ♀ E. B. P., 1 ♀ W. H., 1 ♂, 3 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♂, 1 ♀ E. B. P., 2 ♂, 1 ♀ A. H.

Eriades rubicolus, Per.

Near Palma, Lluchmayor Road: *June* 28.—2 ♂, 5 ♀ E. B. P., 3 ♀ A. H.
Plain of Palma, road to Soller: *June* 29.—1 ♀ A. H.
Lluch: *July* 6.—2 ♀ W. H., 1 ♂, 2 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—2 ♀ A. H.
Base of Monte Sentuiri: *July* 6.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♂ A. H.
Road from Pollensa to Port: *July* 9.—1 ♀ A. H.
Near Porto Pi: *July* 10.—1 ♂ A. H.

Osmia notata, F.

Near Porto Pi: *June* 27.—1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—6 ♀ A. H.
Soller Pass, upper half of S. zigzags: *July* 1.—2 ♀ E. B. P., 1 ♀ W. H.
Soller Pass: *July* 2.—1 ♀ A. H.
Above Soller Pass: *July* 3.—1 ♀ A. H.
Soller to Lluch: *July* 5.—4 ♀ E. B. P., 6 ♀ A. H.

Osmia cœrulescens, L.

Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—1 ♀ A. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♀ W. H.

Osmia aurulenta, Pz.

Above Soller Pass: *July* 3.—1 ♀ (worn) W. H.

Osmia adunca, Ltr.

Castle Bellver, 250–400 ft.: *June* 26.—4 ♀ E. B. P.
Near Palma, Lluchmayor Road: *June* 28.—6 ♀ E. B. P., 8 ♀ A. H.
Lluch: *July* 6.—1 ♀ W. H., 2 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—1 ♂ E. B. P., 4 ♀ W. H.
Pollensa to Castillo del Rey: *July* 7.—2 ♀ E. B. P., 2 ♀ W. H.

Osmia tridentata, Duf. Perr.

Road from Lluch to Pollensa: *July* 6.—1 ♀ (worn), W. H.

Crocisa ramosa, Lep.

Castle Bellver, 250–400 ft.: *June* 26.—1 ♀ E. B. P.
Near Porto Pi: *June* 27.—1 ♂ W. H. *July* 10.—1 ♂ A. H. *July* 12.—1 ♂ E. B. P.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H
Soller Pass, upper half of S. zigzags: *July* 1.—3 ♂ W. H.
Above Soller Pass: *July* 2.—1 ♂ E. B. P.
Soller to Port: *July* 4.—1 ♂ E. B. P., 1 ♂ A. H.
Soller to Lluch: *July* 5.—2 ♂ E. B. P.
Lluch: *July* 6.—1 ♀ W. H., 1 ♂, 1 ♀ A. H.
Road from Lluch to Pollensa: *July* 6.—6 ♂ E. B. P., 2 ♂, 2 ♀ W. H., 2 ♂ A. H.
Pollensa to Castillo del Rey: *July* 7.—5 ♂ E. B. P., 2 ♀ W. H., 5 ♂, 2 ♀ A. H.
Road from Pollensa to Port: *July* 8.—1 ♂ E. B. P., 3 ♂ W. H. *July* 9.—2 ♀ E. B. P.
Little Albufera: *July* 8.—3 ♂ A. H.

Podalirius albigenus, Lep.

Castle Bellver, 250–400 ft.: *June* 26.—2 ♀ W. H., 2 ♀ A. H.
Near Porto Pi: *June* 27.—2 ♀ E. B. P., 3 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—4 ♂, 2 ♀ E. B. P., 2 ♂, 1 ♀ A. H.
Soller to Port: *July* 4.—1 ♂ E. B. P.

Podalirius 4-fasciatus, Vill.

Common.

Eucera grisea, F.

Near Porto Pi: *June* 27.—2 ♀ E. B. P., 1 ♀ A. H.
Near Palma, Lluchmayor Road: *June* 28.—1 ♀ A. H.

[The remarks on *Chalicodoma sicula* (p. 620) apply to this species, of which the examples were also in an extremely worn condition. E. B. P.]

Bombus terrestris, L., var. *ferrugincus*, Schmied.

Castle Bellver: *June* 26.—4 ☿ W. H.
Near Porto Pi: *June* 27.—1 ☿ E. B. P.

Soller Pass: *June* 29.—1 ♂, 1 ☿ E. B. P., 1 ♂, 2 ☿ A. H. *June* 30.—1 ♂ A. H. Below S. zigzags: *July* 1.—1 ♂, 1 ♀ W. H. *July* 2.—1 ☿ A. H. Above Pass: *July* 2.—1 ♀, 1 ☿ E. B. P. *July* 3.—1 ♀ E. B. P., 2 ☿ W. H.
Soller to Port: *July* 4.—1 ♀, 1 ☿ E. B. P.
Little Albufera: *July* 9.—1 ☿ A. H.

[Many more were seen and not taken, especially on Soller Pass. E. B. P.]

Apis mellifica, L.

Everywhere.

II. Spain (1901–2).

Introduction by E. B. Poulton, F.R.S.

A few specimens of four species of ants taken by the present writer near Barcelona in 1900 are included in this section, as well as the captures on July 17, 1901, at Cerbère, the French frontier station at the east end of the Pyrenees.

The number of specimens submitted to Mr. Saunders was much smaller than in the case of Majorca, being 1491 in the first instance, together with 187 which were looked upon as duplicates. The numbers from the various localities are as follows (see Table, p. 625)—

The number of specimens is thus considerably less than half those captured in Majorca (June 26 to July 12, 1901). On the other hand, the number of species from the mainland recognized by Mr. Saunders is far greater, being 205 as compared with 143. This marked difference is no doubt in part due to the wider range covered both in space and time on the mainland; but making all allowances it is probably chiefly the result of the more limited number of species in the island fauna. The relative peculiarity of the latter is also well seen in the fact that five of its species are described as new, and of these one only occurs in the mainland list, viz. *Halictus dubitabilis*. No other new species is described from the mainland, although both lists contain forms which may be new, but

Cerbère, July 17, 1901	179 specimens.
Port Bou, June 24, 1901	179 ,,
Barcelona, June 25 } ,, July 13 } 1901 ,, July 16 }	310 ,,
Montserrat (including Monistrol), July 13–16, 1901	493 ,,
Duplicates chiefly from Port Bou and Barcelona, 1901	187 ,,
Sierra de Guadarrama, La Granja (July 20–26), and El Escorial (July 28), including a few from Segovia (July 27), Madrid (July 17), and Burgos (July 30) 1902	330 ,,
Total . .	1678 ,,

either obscure or represented by insufficient material. Only 73 species, or as nearly as possible half of the Majorcan species, are common to the two lists, so that altogether 275 species are distinguished in this memoir.

It would be rash to build much on a comparison of the lists of Aculeates obtained in such short visits, lists which are obviously very incomplete. Nevertheless, they probably contain the majority of the commonest species to be found at the times when the collections were made. A brief tabular statement (see p. 626) will show at a glance the groups which in our limited experience were found to be strongly or feebly developed in the island fauna as compared with the mainland.

A brief account of the chief characteristics of the localities on the mainland is given below. The order followed is that of the dates, beginning with the earliest.

1900.

In the wet and cold spring of 1900 I stayed at Barcelona for two or three days before visiting Majorca. On March 20 a little collecting was attempted at Vallvidrera, on the ridge of the hills behind the city. It was rather warmer

	No. of species in Majorcan list.	No. of species in mainland list.	Species common to both.
Ants . . .	11	16	7
Scolia . . .	2	7	2
Pompilus . .	16	8	2
Salius . . .	4	0	0
Ammophila . . (and *Psammophila*)	2	5	2
Sphex . . .	3	5	2
Bembex . . .	1	4	1
Cerceris . .	4	8	4
Oxybelus . .	1	4	1
Crabro . . .	4	2	1
Odynerus . .	5	8	4
Prosopis . .	6	10	5
Colletes . . .	0	6	0
Sphecodes . .	3	6	2
Halictus . .	13	25 (including *H. dubitabilis*, n. sp.)	7
Andrena . .	5	5	2
Ceratina . .	3	7	2
Megachile . .	5	11	4
Anthidium . .	5	8	4
Osmia . . .	5	7	3
Podalirius . .	2	9	2
Psithyrus . .	0	1	0
Bombus . .	1	5	1

than usual on that day, and *Eristalis* was seen upon the wing, but nearly the whole of the few captures were made

by turning over stones. The only Hymenoptera were ants belonging to four species. A visit to Montserrat, the locality which we found so rich in July 1901, yielded very few insects, and no Hymenoptera at all.

1901.

June 24.—Mr. W. Holland, Mr. A. H. Hamm, and I arrived at Port Bou, the Spanish frontier station in the Eastern Pyrenees, late at night on June 23. The next boat for Majorca did not leave until the evening of the 25th, so it was decided to spend the whole of the 24th collecting at Port Bou, instead of going on to Barcelona. First the bare hot slopes near the station were explored, and many insects captured; then, following a hint given by the proprietor of the hotel, we penetrated a valley running up into the hills behind the little port. At the bottom of the valley there was a stream with abundant and varied plants; but the slopes also were still green and afforded a rich collecting ground. Lepidoptera were by no means common, but of insects generally we saw far more than on any other occasion throughout the journey. It is a locality which would probably well repay a more extended visit.

June 25.—The train for Barcelona started early in the morning, so that no insects could be collected at Port Bou on this day. Barcelona was reached a few hours before the boat sailed, and a considerable number of insects were taken in waste ground upon which wild flowers were growing.

July 13.—We landed at Barcelona in the morning, and spent some hours collecting in waste ground. In the early afternoon we took the train for Montserrat. A few insects were caught at Monistrol (2200 ft.) while waiting for the cars of the funicular railway. The terminus on Montserrat was reached early in the evening in time for a little collecting. At the height of the terminus and Hospederia (about 3000 ft.) the vegetation was fresh and green, and the collecting most interesting, varied, and tolerably rich. The bramble blossoms were at their best and very attractive.

July 14.—The whole day was spent at about the height of the Hospederia and not far from it. The level mountain path which begins opposite the Hospederia was

explored for a considerable distance, and many productive spots were searched.

July 15.—This day was occupied in a walk to San Geronimo and the summit of the mountain (4000 ft.). Good collecting was found in a great variety of conditions—an alternation of bare rocky slopes, shady woods, and sunny valleys. Just below the summit rich collecting was found in the fine, open, grassy valley, at the head of which is the hermitage of San Geronimo.

July 16.—The collecting on this day was an exact repetition of that upon July 13, taken of course in the reverse order—at Montserrat, in the neighbourhood of the Hospederia, before starting; at Monistrol waiting for the main-line train; and at Barcelona in waste ground.

July 17.—We arrived at Cerbère, the French frontier station, at night, and collected for several hours next morning (17th). The vegetation was far more parched than at Port Bou three weeks before; but apart from this the hills were not so accessible, and the country in the neighbourhood of the station much cultivated and less favourable as a collecting ground. Nevertheless, we captured a large number of insects of several orders, conveying a fair idea of some dominant elements in the insect fauna about the middle of July.

Thus a successful expedition was brought to a successful close. The weather on the mainland was perfect, every day bringing cloudless skies and bright sun.

1902.

To pass from the cold, sunless summer of 1902 in England to the glaring light and heat of Madrid was a contrast too sharp for human nature to bear with equanimity; so, after capturing a few insects in the Park on July 17, I took the advice of my kind friends Señor Don Ignacio Bolivar and Mr. G. C. Champion and started for La Granja (San Ildefonso) in the Sierra Guadarrama. This little town, with an altitude of about 4000 ft., possesses, at any rate in the month of July, the most delightful atmosphere and climate. During the whole visit there was neither rain nor cloud to interfere with the pursuit of natural history. At a rather higher elevation than the town the extensive Palace grounds contain abundant streams and woods, intersected by broad, sunny drives. The trees are rather small, permitting the pene-

tration of plenty of light, and thus favouring a luxuriant and varied undergrowth. Outside the town in another direction is open heath-clad country, traversed by streams bordered with thickets and small trees. Behind La Granja rises the fine mountain of La Peñalara with an altitude of 7976 ft. The first part of the ascent is made through pine woods and upland lawns, the last part over bare slopes with a scanty vegetation. Some hundreds of feet below the summit a few masses of snow still resist the heat of July, aided by the shade of a ravine and the artificial protection of litter.

It will be realized from the above description that La Granja is a remarkably favourable locality for the naturalist. I have never seen so much insect life or such evidence of injury from the attacks of enemies. Corresponding with these indications—the symmetrically torn and notched wings of freshly-emerged butterflies—I noticed that the birds were abundant and of many species. The numbers of birds and the prevalence of injured specimens were both especially characteristic of the Palace grounds.

The specimens from La Granja were taken at a height of about 4000 ft. The elevation of the Palace is given at 3907 ft., and the grounds rise with the slope of the Sierra to a considerably higher level. The captures outside the town were made, in some cases, at a rather lower level, in others as high or higher than the Palace. An approximate elevation of "about 4000 ft." is recorded for the insects taken upon all dates except August 25, when an excursion was made to near the summit of Peñalara. Captures were made at all the levels, including the top of a castellated mass of rock at a probable height of about 7700 ft. Insects were collected during the visit to La Granja from the 20th to the 26th of July, both dates inclusive.

In concluding a brief account of this visit to La Granja, I desire to express my obligations to Monsieur Chretien for his great kindness in inviting me to reap the fruits of his much longer and more intimate experience of this delightful locality.

July 27.—An early start was made for Segovia, where several hours were spent. A little collecting was done on the outskirts, and a considerable amount in a paved courtyard outside the cathedral. The wild flowers growing at the boundaries of the enclosure, and between the paving-

stones, as well as on a piece of waste ground at one side, attracted many insects, of which a fairly representative collection was made. The elevation is given at 3280 ft.

July 28.—El Escorial. In the morning ants were collected in one of the main streets, and in the afternoon a number of insects were captured by a little stream just above the town, and on the slope of the Sierra. Insects were abundant and varied, and considering the short space of time which was available, a fair number of species were taken. The altitude was about 2900 to 3000 ft. Although rich in insect life the Sierra Guadarrama at El Escorial is not nearly so varied or so attractive as at La Granja. The great expanse of open mountain side was well clothed with plants of many species, but the woods and groves and abundant streams were wanting.

July 30.—On the return journey one or two insects were taken at Burgos (about 3000 ft.).

In conclusion I desire to thank Colonel Yerbury for his kindness in naming the *Asilidæ* which were found attacking the Aculeates.

E. B. Poulton.

All captures in the years 1900 *and* 1902 *were made by E. B. Poulton, and no initials are affixed to these specimens. The captors in* 1901 *are indicated as in the Majorcan list, by their initials, E. B. P., W. H., and A. H.*

Camponotus maculatus, F.

1900. Barcelona, Vallvidrera, under stone: *Mar.* 20.—4 ☿.
1901. Port Bou: *June* 24.—1 ☿ W. H.
Montserrat, near Terminus: *July* 14.—1 ♂, 14 ☿ E. B. P.
Monistrol: *July* 16.—1 ♂ E. B. P.

Camponotus maculatus, race cognatus.

1901. Port Bou: *June* 24.—1 ☿ E. B. P.

Camponotus cruentatus, Ltr.

1900. Barcelona, Vallvidrera, under stone: *Mar.* 20.—4 ☿.
1901. Montserrat, near Terminus: *July* 13.—1 ☿ E. B. P. *July* 14.—7 ☿ E. B. P., 16 ☿ A. H.

1902. La Granja, Palace Grounds: *July* 22.—1 ♂.
El Escorial: *July* 28.—2 ♂, 4 ☿, 8 ♀ (one being devoured by *Dasypogon diadema* ♀, the other by *Machimus chrysitis* ♀).

CAMPONOTUS FORELI, Emery.

1901. Monistrol: *July* 16.—1 ☿ E. B. P.
1902. La Granja, Peñalara (about 7000 ft.): *July* 25.—12 ☿ on small composite flower.

CAMPONOTUS LATERALIS, Oliv.

1901. Port Bou: *June* 24.—4 ☿ W. H.
Montserrat, near Terminus: *July* 14.—6 ☿ E. B. P. Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—3 ☿ E. B. P. Near summit, San Geronimo (about 4000 ft.): *July* 15.—2 ☿ E. B. P.

MYRMECOCYSTUS ALBICANS, Roger (?).

1902. La Granja: *July* 24.—1 ♂. La Granja, Peñalara, near top (about 7700 ft.): *July* 25.—1 ♀ (being devoured by *Dysmachus trigonus* ♂).

FORMICA RUFA, L.

1902. La Granja, Palace Grounds: *July* 22.—2 ☿. *July* 24.—1 ♀ of race *pratensis* (being devoured by *Dasypogon diadema* ♀). La Granja, path to Peñalara (about 5500 ft.): *July* 25.—1 ♀.

FORMICA FUSCA, L.

1901. Port Bou: *June* 24.—3 ☿ W. H.
Montserrat, near Terminus: *July* 14.—1 ☿ E. B. P.

FORMICA FUSCA, race CUNICULARIA.

1901. Port Bou: *June* 24.—2 ☿ A. H.

FORMICA FUSCA, race CINEREO RUFIBARBIS.

1901. Barcelona: *June* 25.—2 ☿ A. H. *July* 13.—1 ☿ A. H.
1902. La Granja: *July* 20.—11 ☿.

Lasius niger, L.

1902. Madrid: *July* 17.—1 ♂, 4 ☿.
La Granja: *July* 23.—6 ☿.
Segovia (3280 ft.): *July* 27.—3 ☿.
El Escorial: *July* 28.—51 ♂, 13 ♀, 9 ☿, one pair *in copulâ*.

Lasius niger, race emarginatus (?).

1901. Port Bou: *June* 24.—7 ☿ A. H.

Tapinoma erraticum, Ltr.

1902. La Granja: *July* 23.—1 ☿.

Tetramorium cæspitum, L.

1900. Barcelona, Vallvidrera: *Mar.* 20.—1 ☿.
1902. La Granja, Palace Grounds: *July* 20.—1 ♂.
El Escorial: *July* 28.—1 ♀.

Aphænogaster barbara, L.

1900. Barcelona, Vallvidrera, under stone: *Mar.* 20.—1 ☿.
1901. Port Bou: *June* 24.—14 ☿ W. H., 70 ☿ (major and minor) A. H.
1902. Segovia: *July* 27.—17 ☿.

Aphænogaster structor, Ltr.

1902. Madrid: *July* 17.—6 ☿.

Aphænogaster testaceopilosa, Luc.

1901. Barcelona: *July* 13.—1 ☿ E. B. P.

Aphænogaster striola, Roger.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ☿ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P., 1 ♀ A. H.
Ditto (about 4000 ft.): 1 ♀ A. H.

Pheidole megacephala, F.

1901. Port Bou: *June* 24.—1 ♀ W. H., 10 ☿ A. H.
Montserrat, near Railway Terminus: *July* 13.—3 ♀ E. B. P., 1 ♀ W. H., 1 ♂, 15 ♀ A. H. (all winged forms). *July* 15.—1 pair *in copulâ*, E. B. P., 3 ☿ A. H.

Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂, 1 ♀ E. B. P., 1 ♀ W. H., 4 ☿ A. H.
Near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ A. H.

Cremastogaster scutellaris, Oliv. var.

1901. Montserrat, near Railway Terminus: *July* 14. —15 ☿ E. B. P.

Myzine 3-punctata, Rossi.

1901. Port Bou: *June* 24.—1 ♂ E. B. P., 2 ♂ A. H.

Myzine 3-punctata, var. *nigrifrons*, Sm.

1901. Cerbère: *July* 17.—4 ♂ E. B. P., 5 ♂ W. H. 4 ♂ A. H.

Tiphia femorata, F.

1902. La Granja: *July* 23.—2 ♂ (one being devoured by *Dasypogon diadema* ♀).

Scolia flavifrons, F.

1901. Port Bou: *June* 24.—1 ♀ W. H.
Barcelona: *June* 25.—7 ♂ E. B. P., 1 ♂ A. H.

Scolia interstincta, Kl.

1901. Cerbère: *July* 17.—1 ♂ A. H.
Montserrat, near Railway Terminus: *July* 15. —1 ♂ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂, 3 ♀ E. B. P., 1 ♀ A. H.

Scolia 4-punctata, F. Common.

Captured (1901) at Cerbère, Port Bou, Barcelona, Montserrat, and (1902) La Granja and Segovia.

Scolia hirta, Schrk.

1901. Port Bou: *June* 24.—3 ♂ A. H. (one a var. with single abdominal band).
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P.

Scolia unifasciata, Cyril.

1902. La Granja: *July* 22.—4 ♂.
Segovia: *July* 27.—2 ♂.
El Escorial: *July* 28.—1 ♂.

Scolia (*Elis*) villosa, F.

1901. Port Bou: *June* 24.—1 ♂ W. H.
Cerbère: *July* 17.—10 ♂ E. B. P., 13 ♂ W. H., 10 ♂, 1 ♀ A. H.
1902. La Granja: *July* 24.—1 ♂.
Segovia: *July* 27.—18 ♂, 1 ♀.
El Escorial: *July* 28.—1 ♂.

Scolia (*Elis*) 6-maculata, F.

1902. La Granja, Peñalara, near summit (7700 ft.): *July* 25.—1 ♂.

Pompilus (*Pedinaspis*) aurivilliusi, Tourn. (?).

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P.

Pompilus luctigerus, Cost.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ W. H.

A well-marked ♂, easily recognizable by the tufts of hair on the 6th ventral segment.

Pompilus viaticus, L.

1902. La Granja: *July* 20.—1 ♀ (being devoured by *Dasypogon diadema* ♀). *July* 22.—1 ♀.

[The striking mimetic resemblance borne by the Dipterous captor to its Aculeate prey led to the note on Asilid mimicry at the end of this memoir, p. 661. E. B. P.]

Pompilus rufipes, L., var.

1901. Port Bou: *June* 24.—1 ♂ A. H.

Pompilus fuscipennis, V. de L.

1902. La Granja: *July* 22 and 26.—2 ♀.
La Granja, path to Peñalara (about 5000 ft.): *July* 25.—1 ♀.

Fine examples of this very large species.

Pompilus fumipennis, Lett., var. (?).

1902. La Granja, path to Peñalara (4000–7000 ft.): *July* 25.—1 ♀.

Pompilus indelictus, Tourn. (?).

1902. La Granja, above Palace: *July* 21.—1 ♀.

POMPILUS 4-PUNCTATUS, F.

1902. La Granja, above Palace: *July* 21.—1 ♀.

PSEUDAGENIA CARBONARIA, Scop.

1902. La Granja, Palace Grounds: *July* 20.—1 ♀.

ASTATA BOOPS, Schr.

1901. Monistrol: *July* 16.—1 ♀ E. B. P.

TACHYTES EUROPÆA, Kohl.

1902. La Granja: *July* 24.—1 ♂. *July* 26.—1 ♀.

TACHYSPHEX PYGIDIALIS, Kohl.

1901. Port Bou: *June* 24.—2 ♂, 1 ♀ A. H.
Barcelona: *July* 16.—3 ♀ A. H.

TACHYSPHEX EUROPÆA, Kohl.

1901. Port Bou: *June* 24.—1 ♂ A. H.

TACHYSPHEX PANZERI, V. de L.

1901. Barcelona: *July* 16.—2 ♀ A. H.

TRYPOXYLON SCUTATUM, Chevr.

1901. Montserrat, near Railway Terminus: *July* 15.
—1 ♀ A. H.

TRYPOXYLON FIGULUS, L.

1902. La Granja: *July* 23.—1 ♀.

AMMOPHILA SABULOSA, L.

1901. Montserrat, near Railway Terminus: *July* 14.
—1 ♂ E. B. P., 1 ♂ W. H.

AMMOPHILA HEYDENI, Dhl.

1901. Cerbère: *July* 17.—1 ♂ E. B. P., 2 ♂, 1 ♀
W. H., 2 ♂, 2 ♀ A. H.
1902. El Escorial: *July* 28.—1 ♀.

AMMOPHILA IBERICA, Andr.

1902. El Escorial: *July* 28.—1 ♀.

Psammophila tydei, Guil.

1901. Port Bou: *June* 24.—1 ♀ E. B. P., 1 ♀ A. H.
Barcelona: *June* 25.—2 ♂ A. H. *July* 13.—1 ♀ W. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ W. H.

Psammophila hirsuta, Scop.

1901. Montserrat (about 3000 ft.), near Railway Terminus: *July* 14.—4 ♂ E. B. P., 1 ♂ W. H. *July* 15.—1 ♂ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—4 ♂ E. B. P., 4 ♂ W. H., 4 ♂ A. H.
1902. La Granja, Palace Grounds: *July* 20.—1 ♂. Above Palace: *July* 21.—1 ♂. *July* 24.—1 ♂.
Peñalara, near summit (about 7500 ft.): *July* 25.—Swarm seen and several specimens captured.
El Escorial: *July* 28.—1 ♂.

[A brief account of the swarm on Peñalara, together with a suggestion as to its probable significance, is given in Proc. Ent. Soc. Lond., 1904, p. xxiv. E. B. P.]

Sphex nudatus, Kohl. (?).

1902. La Granja: *July* 24.—1 ♀.

Sphex albisectus, Lep.

1901. Port Bou: *June* 24.—1 ♂ A. H.
Barcelona: *July* 16.—1 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14.—1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ A. H.

Sphex subfuscatus, Dhl.

1901. Cerbère: *July* 17.—1 ♀ E. B. P.
Port Bou: *June* 24.—1 ♂ E. B. P.
1902. La Granja, above Palace: *July* 20.—1 ♂.

Sphex flavipennis, Ltr.

1901. Port Bou: *June* 24.—1 ♂ A. H.
Cerbère: *July* 17.—1 ♂ E. B. P.
Montserrat, near Railway Terminus: *July* 14.—1 ♂ W. H., 1 ♀ A. H.

SPHEX MAXILLOSUS, L.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ E. B. P.

SCELIPHRON FEMORATUM, F.

1901. Port Bou: *June* 24.—1 ♂ E. B. P.

SCELIPHRON PENSILIS, Ill.

1901. Cerbère: *July* 17.—1 ♂ W. H.
Port Bou: *June* 24.—1 ♀ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ W. H.
1902. La Granja, Palace Grounds: *July* 20.—1 ♂.
Ditto, above Palace: *July* 21.—1 ♀.

SCELIPHRON SPIRIFEX, L.

1901. Barcelona: *July* 13.—1 ♀ E. B. P., 1 ♀ W. H.

PEMPHREDON AUSTRIACUS, Kohl. (?).

1901. Barcelona: *July* 13.—1 ♀. W. H., 2 ♂, 2 ♀ A. H.

NYSSON SCALARIS, Duf.

1902. La Granja: *July* 24.—1 ♂. *July* 26.—1 ♂, 1 ♀.

BEMBEX INTEGRA, Pz.

1902. La Granja: *July* 20.—1 ♀. *July* 25.—2 ♂. *July* 26.—1 ♂.
Ditto, above Palace: *July* 21.—1 ♀.
Ditto, Palace Grounds: *July* 22.—1 ♀.

BEMBEX SINUATA, Ltr.

1901. Cerbère: *July* 17.—1 ♂ W. H., 1 ♂ A. H.
Barcelona: *July* 13.—1 ♀ E. B. P., 1 ♂ A. H.
July 16.—Abundant.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ E. B. P.

BEMBEX OCULATA, Ltr. var.

1901. Barcelona: *June* 25.—1 ♂ E. B. P.

Bembex mediterranea, Hdl.

1901. Barcelona: *July* 16.—1 ♀ E. B. P.

Cerceris bupresticida, Duf.

1902. La Granja: *July* 20.—5 ♀. *July* 23.—4 ♂.
El Escorial: *July* 28.—1 ♂.

Cerceris 4-maculata, Duf.

1901. Monistrol: *July* 16.—1 ♀ E. B. P.

Cerceris emarginata, Pz.

1901. Cerbère: *July* 17.—1 ♂ E. B. P.
Port Bou: *June* 24—1 ♂ W. H.
Barcelona: *July* 13.—1 ♂ W. H., 1 ♂ A. H. *July* 16.—2 ♂ E. B. P., 1 ♂ W. H., 2 ♂, 1 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14. —2 ♂ E. B. P.
Monistrol: *July* 13.—1 ♀ E. B. P. *July* 16.—1 ♂ A. H.

Ditto, var. (?).

1902. La Granja: *July* 23.—1 ♂. *July* 24.—1 ♂. *July* 26.—1 ♂.

Cerceris rybyensis, L.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ E. B. P., 1 ♂ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P., 1 ♀ A. H.
Ditto, near summit (about 4000 ft.): *July* 15. —1 ♀ A. H.

Ditto, var.

1901. Barcelona: *July* 16.—1 ♀ A. H.

Cerceris 4-cincta, V. de L.

1901. Barcelona: *July* 16.—1 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14. —2 ♂ E. B. P., 1 ♂ W. H., 3 ♂, 1 ♀ A. H. *July* 15.—1 ♀ E. B. P., 1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—4 ♂ E. B. P., 1 ♂ A. H.

CERCERIS FERRERI, V. de L.

1901. Port Bou: *June* 24.—1 ♂ E. B. P.

CERCERIS LABIATA, F.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ E. B. P.

CERCERIS ARENARIA, L.

1901. Montserrat, near Railway Terminus: *July* 14. —3 ♂ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ W. H.

PHILANTHUS TRIANGULUM, F.

1901. Barcelona: *June* 25.—2 ♂ E. B. P., 4 ♂ A. H. *July* 13.—3 ♂ E. B. P. *July* 16. —Abundant. Females captured as well as males, although not in equal numbers.

OXYBELUS 14-NOTATUS, Jur.

1901. Barcelona: *July* 13.—1 ♂ W. H., 1 ♂ A. H.

OXYBELUS 3-SPINOSUS, F.

1901. Barcelona: *July* 13.—1 ♂ A. H. *July* 16. —1 ♀ W. H.

OXYBELUS MELANCHOLICUS, Chevr.

1902. La Granja, above Palace: *July* 21.—1 ♀.

OXYBELUS LAMELLATUS, Oliv.

1901. Barcelona: *June* 25.—3 ♀ A. H.

ENTOMOGNATHUS BREVIS, V. de L.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂, 1 ♀ E. B. P.

CRABRO HYPSÆ, de Stef., *punctatus*, H.-Sch. (nec Lep.?).

1901. Cerbère: *July* 17: 1 ♀ E. B. P.

CRABRO CLYPEATUS, Schreb.

1901. Cerbère: *July* 17.—1 ♀ A. H.
Barcelona: *July* 16.—1 ♀ A. H.

CELONITES ABBREVIATUS, Vill.

1901. Cerbère: *July* 17.—1 ♂ E. B. P.

Vespa germanica, Fab.

1901. Barcelona: *June* 25.—1 ♀ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ A. H.

Vespa sylvestris, Scop.

1902. La Granja: *July* 20.—1 ☿, 1 ♀. *July* 25.—1 ☿. Above Palace: *July* 21.—1 ☿.

Polistes gallica, L. Very common.

[At Port Bou this species was seen to be devoured by *Dasypogon diadema* ♀. (Trans. Ent. Soc. Lond., 1902, p. 335.) E. B. P.]

Eumenes coarctata, L. Common.

Rhynchium oculatum, F.

1901. Barcelona: *July* 16.—2 ♀ E. B. P., 1 ♂ A. H.
Monistrol: *July* 13.—1 ♀ E. B. P.

Odynerus opacus, Mor.

1901. Barcelona: *July* 16.—1 ♀ A. H.

Odynerus dantici, Rossi.

1901. Barcelona: *July* 13.—2 ♂ E. B. P., 3 ♂, 1 ♀ A. H. *July* 16.—4 ♀ E. B. P., 1 ♂, 1 ♀ W. H., 3 ♂, 5 ♀ A. H.

Odynerus dantici, var.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—2 ♂ E. B. P., 2 ♂ A. H.
1902. La Granja: *July* 23.—3 ♂.
El Escorial: *July* 28.—1 ♀.

Odynerus parvulus, Sauss., var. (?) ♂.

1901. Port Bou: *June* 24.—1 ♂ A. H.
1902. La Granja: *July* 23.—2 ♂.
El Escorial: *July* 28.—2 ♂.

In these specimens all the segments are bordered with yellow, and the antennæ are pale beneath.

Odynerus simplex, Fab.

1901. Barcelona: *June* 25.—1 ♂, 1 ♀ E. B. P. *July* 16.—1 ♀ E. B. P., 4 ♀ A. H.
1902. El Escorial: *July* 28.—1 ♀.

ODYNERUS ELEGANS, Wesm.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♀ E. B. P.

ODYNERUS SPIRICORNIS, Spin.

1902. La Granja: *July* 20.—1 ♂, 8 ♀. *July* 22.— 1 ♂, 1 ♀.

ODYNERUS PARIETUM, L.

1901. Port Bou: *June* 24.—1 ♂ A. H.
Barcelona: *July* 13.—1 ♂ E. B. P., 1 ♂ A. H. *July* 16.—2 ♂ A. H.
Montserrat, near Railway Terminus: *July* 14. —2 ♀ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—3 ♂ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ E. B. P.

ODYNERUS ALPESTRIS, Sauss.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ A. H.

PROSOPIS VARIEGATA, F.

1901. Cerbère: *July* 17.—1 ♂ E. B. P.
Monistrol: *July* 16.—1 ♀ A. H. Var. with white central line on clypeus.
1902. La Granja: *July* 24.—1 ♀. Var. with clypeus spotted. *July* 26.—1 ♂.

PROSOPIS PICTUS, Smith.

1901. Barcelona: *July* 13.—1 ♀ E. B. P., 3 ♂ W. H., 2 ♂ A. H. *July* 16.—1 ♀ A. H.

PROSOPIS COMMUNIS, Nyl.

1902. La Granja, Palace Grounds: *July* 20.—1 ♀.

PROSOPIS SULPHURIPES, Grib.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ E. B. P. *July* 15.—1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P.

Prosopis hyalinatus, Sm.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♂, 1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—2 ♀ E. B. P.
1902. La Granja: *July* 23.—1 ♂, 1 ♀.
Segovia: *July* 27.—1 ♂.

Prosopis, sp. near genalis, Thoms., n. sp. (?).

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♀ E. B. P.

Prosopis clypearis, Schk.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♀ E. B. P., 2 ♂ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—2 ♀ E. B. P.

Prosopis pictipes, Nyl.

1901. Port Bou: *June* 24.—1 ♂ A. H.
1902. La Granja: *July* 23.—1 ♂.

Prosopis bisinuatus, Forst., *angustatus*, Schk., var. (?).

1901. Barcelona: *June* 25.—1 ♂ A. H. *July* 13. 1 ♂ W. H., 5 ♂ A. H.

Differs from *angustatus* in the thinner antennal scape, and is apparently quite distinct, but a similar difference occurs between *brevicornis* and *imparilis*, which makes one doubt if in both cases there may not be two distinct varietal forms.

Prosopis imparilis, Forst., *brevicornis*, var. (?).

1901. Cerbère: *July* 17.—1 ♂ E. B. P., 1 ♂ A. H.

Colletes ligatus, Er.

1901. Port Bou: *June* 24.—1 ♀ W. H., 1 ♂ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ W. H.

COLLETES, sp. (?). Small, short genæ, very finely-punctured 2nd abdominal segment.

1902. La Granja: *July* 23.—4 ♀. *July* 24.—2 ♀.

The species of this genus are at present in such a confused state that it is useless to describe any as new from females only; the males have been carefully worked, for such species as were known to him, by the Rev. F. D. Morice (Trans. Ent. Soc., 1904, pt. I), but their respective females are in many cases quite unrecognized, and until the many described males can be associated with suitable females it would only be complicating synonymy to give new names to members of the latter sex.

COLLETES PICISTIGMA, Thoms.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ A. H.

Ditto, sp. (?). Large, short genæ, near *picistigma* (?).

1902. La Granja: *July* 24.—1 ♀.

COLLETES FODIENS, Kirb.

1902. La Granja: *July* 23.—1 ♂. *July* 24.—1 ♀. *July* 26.—2 ♀.

COLLETES ABEILLEI, Per. MS.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—2 ♂, 1 ♀ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ W. H.

SPHECODES FUSCIPENNIS, Germ.

1901. Barcelona: *June* 25.—1 ♀ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—2 ♂ E. B. P., 1 ♂ A. H.

SPHECODES GIBBUS, L.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—6 ♂, 1 ♀ E. B. P., 2 ♂ W. H., 3 ♂ A. H.
1902. La Granja: *July* 26.—1 ♂ (being devoured by *Dasypogon diadema* ♀).

Sphecodes subquadratus, Sm.

1901. Montserrat, near Railway Terminus: *July* 15.—1 ♂ E. B. P., 1 ♀ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—9 ♂ E. B. P., 3 ♂ W. H., 6 ♂ A. H.

Sphecodes reticulatus, Thoms.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—16 ♂, 2 ♀ E. B. P., 22 ♂, 1 ♀ (one of the males being eaten by spider on yellow umbelliferous flower-head), W. H., 14 ♂ A. H.
Montserrat, near Railway Terminus: *July* 15.—1 ♂ A. H.

Sphecodes rufiventris, Pz.

1901. Montserrat, near Railway Terminus: *July* 15.—1 ♂ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft): *July* 15.—2 ♂ E. B. P., 1 ♂ W. H.

Ditto, sp. (?).

1901. Montserrat, near Railway Terminus: *July* 15.—1 ♀ A. H.

[The five first-named species of *Sphecodes* are indistinguishable in the field. They fly together, and were all found visiting the flowers in the open grassy valley just below San Geronimo, close to the summit of Montserrat, on July 15, 1901. It will be seen that *S. fuscipennis* and *S. rufiventris* were much less common than the others. The abundance of these Aculeates, as well as their intimate association with one another and with their mimics, is well shown in the following experience. I observed resting on a flower in the valley a black fly with red abdomen, beautifully mimetic of these Hymenoptera. Mr. E. E. Austen kindly informs me that the species is the Tachinid, *Ocyptera brevicornis*, Lw. It occurred to me that by a single strong sweep of the net I should probably secure not only the mimic but a number of its models as well. The twenty-one insects thus captured were carefully labelled and kept distinct from others. With the exception of the fly all are Aculeates, and they are of course

included in the numbers given in the present memoir. Separated out from other captures of the same species the list is as follows:—

Sphecodes fuscipennis . . .	1 ♂
„ *gibbus*	3 ♂
„ *subquadratus* . .	7 ♂
„ *reticulatus* . . .	7 ♂
„ *rufiventris* . . .	1 ♂
The mimetic fly—	
Oeyptera brevicornis . . .	1
	20

The twenty-first insect was the only specimen of *Epeolus productus* (♀) in the material described in this paper.

The whole of the captures made by the three naturalists on that sunny afternoon by San Geronimo afford the material for a much larger group, including far greater numbers of the same species of *Sphecodes* and some additional species of Aculeates with the same general appearance. This complete group is shown below. In the right-hand column will be found a record of all other captures of the constituent species in Spain during the same expedition (1901).

A glance at the table on p. 646 suggests the following conclusions:—

(1) *Sphecodes reticulatus* was the dominant species on July 15, while three out of the five species of *Sphecodes* were far more abundant than any other members of the entire group.

(2) There was an evident special association of the species of the group in the locality at San Geronimo. A large proportion of them were not taken elsewhere.

(3) The elevation had obviously delayed the emergence of the species of *Sphecodes*, so that hardly any females had as yet appeared. The proportion of the sexes only 1000 feet lower was very different.

Mr. Edward Saunders tells me that "with few exceptions the males of *Sphecodes* precede the females by a week or so. In the autumn when both are out the females are found more round the burrows and not so much on the flowers as in the spring. The new females hibernate and the males die off."

(4) It is probable that the stingless males of Aculeates

	Group captured below San Geronimo, near summit of Montserrat (about 4000 feet), July 15, 1901.	Other examples of same species captured elsewhere in Spain, June—July, 1901.
Synaposematic species of *Sphecodes*.	*Sphecodes fuscipennis*. 3 ♂.	1 ♀, Barcelona, June 25.
	,, *gibbus*. 11 ♂, 1 ♀.	
	,, *subquadratus*. 18 ♂.	1 ♂, 1 ♀, Montserrat, ab. 3000 ft., July 15.
	,, *reticulatus*. 52 ♂, 3 ♀.	1 ♂, Montserrat, about 3000 feet, July 15.
	,, *rufiventris*. 3 ♂.	1 ♂, Montserrat, about 3000 feet, July 15.
	,, sp. ?	1 ♀, Montserrat, about 3000 feet, July 15.
Other Aculeates synaposematic with *Sphecodes* group.	*Halictus interruptus*. 1 ♂.	1 ♀, Montserrat, about 3000 feet, July 14. 7 ♀, Port Bou, June 24.
	Male only convergent to *Sphecodes*.	
	Halictus elegans. 1 ♀.	1 ♂, Montserrat, about 3000 feet, July 14.
	Nomada cos. 2 ♀.	
	Osmia fallax. 1 ♂.	
Other Orders of insects mimetic of *Sphecodes*.	Diptera.	
	Oxyptera brevicornis. 1.	

possess some special defence, perhaps by means of a secretion, or the juices of the body. It is difficult otherwise to account for the dominant central species of mimetic groups being composed even temporarily of males, to the almost complete exclusion of females. It must be remembered that tropical *Braconidæ* are freely mimicked (P. Z. S., 1902, p. 230), and that an experiment of Mr. Guy A. K. Marshall's indicates that the latter are defended in

the manner suggested above (Trans. Ent. Soc. 1902, pp. 386, 387).

I cannot doubt that a closer attention to the facts of mimicry in the Aculeates would long ago have revealed the insufficiency of the Batesian hypothesis and the necessity of that to which Fritz Müller was driven in 1870. The group on Montserrat may be compared in the closest manner with the synaposematic Neotropical Rhopalocera. The central species, belonging to the genus *Sphecodes*, represent the *Ithomiinæ*, usually the dominant members of the South American groups. The genera *Halictus*, *Nomada*, and *Osmia*, similarly represent the convergent *Lycorea*, *Heliconius*, and *Actinote*; while the fly *Ocyptera* may be to some extent paralleled by a Heterocerous mimic, such as *Pericopis* or *Castnia*.

As regards both groups we may feel the same confidence that the Müllerian explanation of common warning colours accounts for nearly the whole of the facts: as regards both the same uncertainty as to whether some outlying member, such as the fly in one or *Castnia* in the other, may not be a real (Pseudaposematic) mimic in the Batesian sense. In both groups the fact lost sight of by Bates is equally evident, viz. that the mimicry is closest between those members whose special defence is clearest—that just as the mimicry of Ithomiine by Heliconine far transcends the resemblance borne to the former by Danaine, Nymphaline, Pierine, or moth, so the likeness of other Aculeate genera for *Sphecodes* far surpasses that borne by the mimetic Dipteron. In fact, Mr. Saunders speaks of the similarity between the females of some of the small southern species of *Halictus* and *Sphecodes* being so great that he has often to look for structural characters at the apex of the abdomen in order to decide upon the genus. In speaking of this remarkable resemblance the great Hymenopterist, indeed, suggests the probability that *Halictus* and *Sphecodes* arose from a single stock at no distant date. But, however recent this period may be, it is highly improbable that superficial likeness in colour and pattern can be its heritage, inasmuch as a safe distinction can be established by an appeal to comparatively deep-seated structural characters.

This interesting group is only a section of a very large assemblage of Aculeates characterized by a black ground-colour, and the development of more or less red on the abdominal segments. Mr. Saunders has kindly

given me the constitution, in a general way, of this assemblage in the Palæarctic Region. It is as follows :—

FOSSORES.

Mutilla : only a few males in an extensive genus.
Scolia : ♀ of one species in a genus of about 20 species.
Sapyga : ♀ of one or two species out of 8 or 10.
Myzine: ♀ of one or two species out of 20 or 30.
Pompilus : both sexes of over 200 described species (probably many are synonymous). More than half the genus.
Salius : many species, but less than half the genus.
Ceropales : one species out of about 5.
Pseudagenia : one species out of 4 or 5.
Astatus: nearly all the species of a small genus.
Tachytes and *Tachysphex* : more than half the species in each of these extensive genera.
Larra : one species only.
Gorytes : a small section only of a genus mostly composed of black and yellow wasp-like species.
Entomoscricus : both species.
Mimesa : not far from half of about 15 species.
Sphex : many species of an extensive genus.
Ammophila : many species of an extensive genus.
Alyson (small genus): 2 or 3 species.
Nysson (medium-sized genus): a few species.
Didineis: both species.
Dinetus: 1 species only in genus.
Miscophus: 3 species out of about 10.

ANTHOPHILA.

Prosopis: about 5 species out of 60 or 70.
Halictus: 8 or 10 out of 100 or more.
Sphecodes * : some 20 species or so. Practically the whole genus.
Andrena : about 20 species out of 200 or more.
Nomada * : nearly half a large genus.
Osmia : a very few out of about 200.
Dioxys * : most of the species (about 6 or 8).
Phiarus,* *Pasites*,* *Biastes*,* *Ammobates* * : nearly all the species in these small genera.

The absence of species belonging to the formidable Diploptera is remarkable. A brick-red colour is known on the *basal* segment of the abdomen in several species

* Genera thus marked are known or suspected to be inquiline.

from the Canaries and Madeira, and yellowish-red also in a few European species. It is, however, very little developed, and the effect is quite different from the broad transverse band of the abdomen in *Pompilus*, etc.

This great assemblage of species convergent in colours and pattern can be broken up into many sub-groups, more or less closely welded together by intermediate links. Thus the dark wings and intense black of the species of *Pompilus*, together with the position of their deep red abdominal bands, make a very characteristic sub-group. The black and red species of *Ammophila* form the centre of another, while perhaps the most extensive of all these subordinate associations is that which has *Sphecodes* for its centre—the group of which we had so interesting an experience in the valley below San Geronimo. E. B. P.]

Halictus 4-cinctus, F.

1901. Port Bou: *June* 24.—1 ♀ A. H.
Barcelona: *July* 16.—1 ♂, 3 ♀ W. H., 1 ♀ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—3 ♂ E. B. P., 4 ♂ W. H., 5 ♂ A. H.

Halictus 6-cinctus, F.

1901. Barcelona: *July* 16.—1 ♀ W. H.

Halictus scabiosæ, Rossi. Common, var. (?) *ochraceovittatatus*, Drs.

Halictus tetrazonius, Klug.

1901. Port Bou: *June* 24.—1 ♂, 1 ♀ W. H.

Halictus pyrenæus, Per. (?).

1901. Montserrat, near Railway Terminus: *July* 14.—4 ♀ E. B. P., 3 ♀ W. H., 2 ♀ A. H. *July* 16.—2 ♀ W. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ W. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ E. B. P., 2 ♀ W. H.
1902. El Escorial: *July* 28.—1 ♀.

Halictus, sp. (?).

1901. Montserrat, near Railway Terminus: *July* 14.—2 ♂ A. H.

Allied to *tetrazonius*, but with the mandibles simple; differs from Perez's description of *pyrenæus* in the short cheeks, and the want of the pencils of hairs at the lateral apices of the 4th ventral segment.

Halictus separandus, Schmied.

1901. Port Bou: *June* 24.—1 ♀ A. H.
Cerbère: *July* 17.—1 ♂ E. B. P.
Montserrat, near Railway Terminus: *July* 14.—3 ♂ E. B. P., 1 ♂, 1 ♀ A. H. *July* 16.—1 ♂ W. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ W. H.

Halictus platycestus, Dours.

1901. Barcelona: *July* 16.—2 ♀ E. B. P., 5 ♀ W. H., 1 ♀ A. H.

Halictus leucozonius, Kirb.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ W. H.
Montserrat, near Railway Terminus: *July* 16.—1 ♀ W. H.

Halictus interruptus, Pz.

1901. Port Bou: *June* 24.—2 ♀ E. B. P., 2 ♀ W. H., 3 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14.—1 ♀ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ W. H.

Halictus, sp. (?).

1901. Port Bou: *June* 24.—1 ♀ A. H.

Halictus costulatus, K.

1902. La Granja: *July* 22.—1 ♀. *July* 23.—2 ♀. *July* 24.—2 ♀. *July* 26.—1 ♀. *July* 26.—1 ♂ (being devoured by *Dasypogon diadema* ♀).
La Granja, above Palace: *July* 21.—1 ♀.

HALICTUS ELEGANS, Lep.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ A. H.

This is considered by many authors to be a variety of *cylindricus*, but its elongate face appears to me to separate it easily in both sexes from that species.

HALICTUS CYLINDRICUS, Fab.

1902. La Granja, Palace Grounds: *July* 20.—1 ♀.

HALICTUS MALACHURUS.

1902. La Granja: *July* 23.—1 ♀ (being devoured by *Dasypogon diadema* ♀).

HALICTUS BREVICORNIS, Schk.

1901. Montserrat, near Railway Terminus: *July* 15. —1 ♂ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P., 1 ♀ W. H., 1 ♀ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ A. H.

HALICTUS MINUTISSIMUS, K.

1901. Montserrat, near Railway Terminus: *July* 15. —1 ♀ E. B. P.

HALICTUS PUNCTATISSIMUS, Schenck.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♀ E. B. P.

HALICTUS DUBITABILIS, E. Saund.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ E. B. P.

HALICTUS MUCOREUS, Gv.

1901. Port Bou: *June* 24.—1 ♀ W. H., 1 ♀ A. H.
Barcelona: *July* 16.—1 ♂ E. B. P.
Monistrol: *July* 16.—1 ♀ A. H.

Halictus gramineus, Sm.

1901. Cerbère: *July* 17.—1 ♀ E. B. P., 3 ♀ W. H., 1 ♀ A. H.
Port Bou: *June* 24.—2 ♀ W. H., 4 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14.—7 ♀ E. B. P., 1 ♀ W. H., 3 ♀ A. H. *July* 15.—1 ♀ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—4 ♀ E. B. P., 3 ♀ W. H.

Halictus gemmeus, Drs.

1901. Cerbère: *July* 17.—8 ♀ E. B. P., 7 ♀, 1 ♂ A. H.
Port Bou: *June* 24.—1 ♀ W. H.
Barcelona: *July* 13.—1 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14.—1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000-4000 ft.): *July* 15.—1 ♀ W. H.

Halictus morio, Fab.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♂, 1 ♀ E. B. P.

Halictus leucopus, Kirb.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♂, 1 ♀ E. B. P.

Halictus smeathmanellus, Kirb.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♀ A. H. *July* 15.—1 ♀ A. H.

Andrena pilipes, Fab.

1901. Barcelona: *July* 16.—1 ♀ W. H.

Andrena fulvicrus, Kirb.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ A. H.

Andrena distincta, Luc.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P.

This agrees exactly with a specimen I have in my collection named some years ago by Prof. Perez.

ANDRENA, sp. (?), *dorsata* group.

1902. La Granja, above Palace: *July* 21.—1 ♀.

ANDRENA ALBOFASCIATA, Thoms.

1902. La Granja: *July* 23.—1 ♀.

NOMADA EOS, Schm.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—2 ♀ A. H.

EPEOLUS PRODUCTUS, Thoms.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ E. B. P.

CERATINA CUCURBITINA, Rossi.

1901. Cerbère: *July* 17.—5 ♀ E. B. P., 5 ♀ W. H., 8 ♀ A. H.
Barcelona: *July* 16.—1 ♀ W. H.
Montserrat, near Railway Terminus: *July* 14.—1 ♀ W. H., 1 ♀ A. H. *July* 15.—1 ♀ A. H.

CERATINA ACUTA, Friese.

1901. Cerbère: *July* 17.—1 ♀ E. B. P., 2 ♀ A. H.

CERATINA CYANEA, K.

1901. Cerbère: *July* 17.—1 ♂, 1 ♀ E. B. P., 4 ♂ A. H.

CERATINA CYANEA, K. (?).

1901. Monistrol: *July* 16.—1 ♂ A. H.

This specimen agrees, so far as I can see, essentially with *cyanea*, K., but it has the tubercles white.

CERATINA CALLOSA, F.

1901. Barcelona: *July* 16.—1 ♀ A. H.

CERATINA CHALCITES, Germ.

1901. Montserrat, near Railway Terminus: *July* 14.—2 ♀ A. H.
1902. La Granja: *July* 26.—1 ♀.

CERATINA DALLATORREANA, Friese.

1901. Cerbère: *July* 17.—1 ♀ E. B. P.

Xylocopa violacea, L.

1901. Port Bou: *June* 24.—1 ♀ A. H.

Xylocopa cantabrica, Lep.

1902. La Granja: *July* 20.—2 ♀. *July* 25.—1 ♀.

Xylocopa valga, Gerst.

1902. La Granja: *July* 20.—1 ♂. *July* 24.—1 ♂. *July* 25.—1 ♀

Cœlioxys aurolimbata, Foerst.

1901. Barcelona: *June* 25.—1 ♂ E. B. P. *July* 16.—2 ♀ E. B. P.

Cœlioxys afra, Lep.

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ A. H.

Cœlioxys conoidea, Ill.

1902. La Granja: *July* 25.—1 ♀.

Megachile lagopoda, L.

1901. Barcelona: *June* 25.—1 ♂ A. H. *July* 16.—1 ♂, 1 ♀ E. B. P., 1 ♀ A. H.
1902. La Granja: *July* 25.—1 ♂.
La Granja (on thistle): *July* 26.—3 ♀.

Megachile willughbiella, Kirb.

1902. La Granja: *July* 25.—1 ♀.

Megachile pilicrus, Mor.

1902. La Granja: *July* 25.—1 ♂.
El Escorial: *July* 28.—1 ♀.

Megachile melanopyga, Cost.

1901. Barcelona: *July* 16.—1 ♂ W. H.

Megachile sericans, Duf.

1901. Cerbère: *July* 17.—1 ♂, 4 ♀ W. H.

MEGACHILE ERICETORUM, Lep.

1901. Barcelona: *June* 25.—2 ♂ E. B. P., 3 ♂ A. H. *July* 13.—1 ♂ E. B. P. *July* 16.—1 ♂ E. B. P., 1 ♂ W. H., 4 ♂ A. H.
1902. La Granja: *July* 23.—1 ♂. *July* 25.—2 ♂, 1 ♀. Segovia: *July* 27.—1 ♂.

MEGACHILE CENTUNCULARIS, L.

1901. Barcelona: *June* 25.—1 ♂ A. H. *July* 13.—1 ♂ E. B. P., 1 ♂ W. H. *July* 16.—1 ♂, 1 ♀ E. B. P., 1 ♂, 1 ♀ A. H.

MEGACHILE ARGENTATA, F.

1901. Port Bou: *June* 24.—2 ♂ A. H.
Barcelona: *June* 25.—1 ♀ E. B. P. *July* 13.—2 ♂, 2 ♀ E. B. P., 2 ♂ A. H. *July* 16.—2 ♂ E. B. P.
Montserrat, near Railway Terminus: *July* 14.—1 ♀ E. B. P., 2 ♂ A. H. *July* 15.—1 ♀ E. B. P. *July* 16.—1 ♂ W. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ A. H.
1902. La Granja: *July* 24.—1 ♀.
Segovia: *July* 27.—4 ♂.

MEGACHILE DORSALIS, Per.

1901. Barcelona: *July* 13.—1 ♂ A. H.

MEGACHILE, sp. (?).

1901. Port Bou: *June* 24.—1 ♂ E. B. P.

MEGACHILE APICALIS, Spin.

1901. Cerbère: *July* 17.—1 ♂, 2 ♀ W. H., 2 ♀ A. H.
Barcelona: *July* 13.—1 ♂ A. H. *July* 16.—1 ♀ E. B. P., 1 ♂, 1 ♀ A. H.
1902. Segovia: *July* 27.—5 ♂.

LITHURGUS CHRYSURUS, Fonsc.

1901. Barcelona: *July* 16.—1 ♀ E. B. P., 1 ♀ A. H.
1902. Segovia: *July* 27.—2 ♂.

Anthidium manicatum, L.

1901.—Cerbère: *July* 17.—1 ♀ W. H.
Barcelona: *June* 25.—1 ♂ E. B. P., 2 ♂, 7 ♀ A. H. *July* 16.—1 ♀ W. H., 1 ♂ A. H.
1902. La Granja: *July* 25.—1 ♂.

Anthidium cingulatum, Ltr.

1901. Barcelona: *July* 16.—1 ♀ W. H.
1902. La Granja: *July* 25.—1 ♀.
El Escorial: *July* 28.—1 ♀.

Anthidium florentinum, F.

1901. Port Bou: *June* 24.—1 ♂, 2 ♀ W. H.
Barcelona: *June* 25.—1 ♂ E. B. P., 1 ♂ A. H. *July* 13.—2 ♀ E. B. P., 1 ♂ W. H. *July* 16.—1 ♂, 1 ♀ E. B. P., 1 ♀ W. H., 1 ♂, 1 ♀ A. H.

Anthidium 7-dentatum, Ltr.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ E. B. P., 1 ♀ W. H. *July* 15.—1 ♂ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ W. H.

Anthidium latreillei, Lep.

1901. Cerbère: *July* 17.—2 ♀ E. B. P., 2 ♂, 1 ♀ W. H., 2 ♂, 2 ♀ A. H.
Port Bou: *June* 25.—1 ♀ A. H.

Anthidium oblongatum, Ltr.

1901. Montserrat, near Railway Terminus: *July* 14. —2 ♀ E. B. P. *July* 15.—1 ♂ A. H.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂, 3 ♀ E. B. P., 2 ♂ W. H., 2 ♂ A. H.
1902. La Granja: *July* 22.—1 ♂.
Segovia: *July* 27.—1 ♀.

Anthidium strigatum, Pz.

1901. Cerbère: *July* 17.—1 ♂ E. B. P., 1 ♂ A. H.
Barcelona: *July* 13.—1 ♀ E. B. P.
Montserrat, near Railway Terminus: *July* 14. —1 ♂ A. H.

ANTHIDIUM BELLICOSUM, Lep.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♀ W. H.

STELIS ATERRIMA, Panz.

1901. Montserrat, near Railway Terminus: *July* 14. —1 ♂ E. B. P., 2 ♂ A. H.
1902. El Escorial: *July* 28.—1 ♀.

STELIS BREVIUSCULA, Nyl.

1902. Segovia: *July* 27.—4 ♀.

ERIADES TRUNCORUM, L.

1902. La Granja: *July* 23.—2 ♂.
Segovia: *July* 27.—6 ♂.

ERIADES CRENULATA, Nyl.

1901. Barcelona: *July* 16.—1 ♀ W. H.
Montserrat, near Railway Terminus: *July* 14. —1 ♀ A. H.
1902. Segovia: *July* 27.—15 ♂.

The Montserrat female (July 14, 1901) has no proper ventral brush.

OSMIA FALLAX, Per.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ E. B. P.

Hitherto only recorded from Algeria, so far as I know.

OSMIA BIDENTATA, Mor.

1901. Barcelona: *July* 16.—1 ♀ E. B. P.
1902. Burgos, hill below Castle (about 3000 ft.): *July* 30.—1 ♀.

OSMIA ADUNCA, Pz.

1901. Port Bou: *June* 24.—7 ♀ A. H.
Barcelona: *July* 13.—2 ♂, 2 ♀ E. B. P.
1902. La Granja: *July* 23.—5 ♀. *July* 24.—1 ♂, 1 ♀.

OSMIA, sp. (?).

1901. Barcelona: *July* 13.—3 ♀ E. B. P., 3 ♀ W. H.

Osmia acuticornis, Duf. Perr. (?).

1901. Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♀ E. B. P.

Osmia cœrulescens, L.

1901. Barcelona: *July* 13.—1 ♀ W. H. *July* 16.—1 ♀ A. H.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ A. H.

Osmia aurulenta, Pz.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ E. B. P., 1 ♀ W. H., 2 ♀ A. H.

Crocisa ramosa, Lep.

1901. Barcelona: *July* 16.—2 ♂, 1 ♀ E. B. P.

Podalirius fulvodimidiata, Dours.

1901. Cerbère: *July* 17.—1 ♂ E. B. P., 4 ♂, 3 ♀ W. H., 1 ♂ A. H.

Podalirius bimaculatus, Pz.

1902. La Granja: *July* 22.—1 ♂, 2 ♀. *July* 23.—1 ♂. *July* 24.—2 ♀.
El Escorial: *July* 28.—1 ♂, 1 ♀.

Podalirius garrulus, Rossi.

1901. Cerbère: *July* 17.—1 ♂ W. H., 1 ♀ A. H.
Montserrat, near Railway Terminus: *July* 14.—2 ♂ E. B. P., 1 ♂ A. H.

Podalirius albigenus, Lep.

1901. Cerbère: *July* 17.—1 ♂ W. H.
Port Bou: *June* 24.—1 ♂ E. B. P.
1902. La Granja: *July* 23.—4 ♂, 1 ♀. *July* 25.—1 ♀.

Podalirius 4-fasciatus, Vill.

1901. Port Bou: *June* 24.—1 ♀ E. B. P., 1 ♂ W. H., 2 ♂ A. H.
Barcelona: *June* 25.—1 ♀ E. B. P. *July* 13.—1 ♀ E. B. P., 1 ♀ A. H. *July* 16.—2 ♂, 2 ♀ E. B. P., 2 ♂ A. H.

PODALIRIUS CRASSIPES, Lep.

1901. Montserrat, near Railway Terminus: *July* 14.—1 ♂ E. B. P.
Montserrat, Hospederia to San Geronimo (3000–4000 ft.): *July* 15.—1 ♂ W. H., 3 ♂ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—2 ♂, 1 ♀ A. H.

PODALIRIUS PUBESCENS, F.

1902. La Granja: *July* 23.—4 ♂, 5 ♀. *July* 24.—4 ♀. *July* 25.—1 ♀.

PODALIRIUS FEMORATUS, Oliv.

1902. La Granja: *July* 20.—1 ♂. *July* 22.—1 ♀.
La Granja: *July* 24.—1 ♂. *July* 25.—1 ♂.

PODALIRIUS RETUSUS, Linn. (?).

1902. La Granja, Palace Grounds: *July* 20.—1 ♀. *July* 22.—1 ♀.

The above determination is probable, but the specimens are so faded and weather-beaten that certainty is unattainable.

EUCERA COMMIXTA, D. T.

1902. La Granja: *July* 24.—1 ♀.

PSITHYRUS CAMPESTRIS, Panz.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ E. B. P.

BOMBUS SMITHIANUS, White.

1901. Barcelona: *June* 25.—1 ♀ A. H. *July* 13.—1 ♂, 3 ☿ W. H. *July* 16.—1 ☿ W. H.

BOMBUS AGRORUM, Fab. var.

The males are certainly *agrorum*, and probably therefore the females and workers are varieties of this species.

1901. Montserrat: *July* 14–16.—All forms abundant wherever the mountain was explored—from the Railway Terminus to the summit.

Bombus agrorum, var. pascuorum.

1902. La Granja: *July* 20.—1 ☿. *July* 22.—2 ☿.
Ditto, Palace Grounds: *July* 20.—1 ☿.
Ditto, above Palace: *July* 21.—5 ☿.

Bombus hortorum, L.

1901. Port Bou: *June* 25.—1 ♂ W. H., 3 ♂, 1 ☿ A. H.

Bombus hortorum, var. (posterior tibiæ red-haired).

1902. La Granja: *July* 20.—1 ☿.
El Escorial: *July* 28.—2 ♂, 4 ☿.

Bombus pratorum, L.

1901. Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♀ E. B. P.

Bombus terrestris, L.

1901. Barcelona: *July* 16.—1 ☿ W. H.
Montserrat, near Railway Terminus: *July* 13. —1 ☿ E. B. P.

Bombus terrestris, var. ferrugineus.

1901. Port Bou: *June* 24.—Abundant.
Barcelona: *July* 16.—1 ☿ E. B. P.
Montserrat, near summit, San Geronimo (about 4000 ft.): *July* 15.—1 ♂ W. H.
1902. La Granja: *July* 20.—2 ♀. *July* 26.—1 ☿.
El Escorial: *July* 28.—2 ☿.

Apis mellifica, L.

Fairly common everywhere.

[Freely devoured by the females, occasionally by the males, of *Dasypogon diadema* at La Granja. (Trans. Ent. Soc. Lond., 1902, p. 336, note.) E. B. P.]

APPENDIX.

The mimicry of Aculeata by the Asilidæ and Volucella, and its probable significance. By E. B. POULTON.

I HAVE already stated that I was much struck with the mimetic resemblance borne by the Asilid captor to its Aculeate prey on July 20, 1902 (see p. 634). The commonest form of the variable female of *Dasypogon diadema* reproduces on a larger scale all the conspicuous features of *Pompilus viaticus*:—the dark wings and the black body with a reddish transverse band across the abdomen. In the case of *Pompilus fuscipennis* there is not even the discrepancy in size, while the resemblance in colour is in some respects even closer; for the red abdominal band is single in the *Pompilus*, and, although spread over three segments, appears to be single in the Asilid. In *P. viaticus*, however, the three constituent bands are evident, separated as they are by intervening black areas. This species of Asilid attacks Aculeates far more frequently than any other kind of prey. I observed it devouring small Coleoptera on several occasions at La Granja, once a Hemipteron, and once the male of its own species. In Switzerland I once captured it with a Tachinid fly (*Sarcophaga* sp., Trans. Ent. Soc. Lond., 1902, p. 334). On all other occasions when I have observed it, including the numerous instances recorded in the present memoir, the prey has been Hymenopterous—almost exclusively Aculeates, but now and then Ichneumons. The fact that the Asilid is a special enemy of the group to which *Pompilus* belongs suggests, at first sight, aggressive mimicry as the plausible interpretation of the resemblance—a likeness which may be supposed to facilitate the approach of the captor to its prey. But the swift and sudden swoop of an Asilid upon its victim does not appear to require any accessory aid; furthermore, there is no evidence that *Pompilus* is attacked above all other Aculeates. As a matter of fact this is the single example I have encountered. A surer interpretation of the resemblance seems to be afforded by protective mimicry—a defence against insect-eating vertebrate animals. The Asilid, seeking its prey, frequents places where Aculeates abound, and therefore an Aculeate is for

it a specially advantageous model, the likeness under such favourable conditions assisting it in the struggle with enemies against which the sting of *Pompilus* would be a defence. The striking and conspicuous colouring of this Aculeate renders it especially suitable as a model. Furthermore, the detailed resemblance may have been built up on a foundation provided by a slightly greater initial resemblance to this rather than any other Aculeate genus.

This appears to be the most feasible explanation of Asilid mimicy as a whole. *Asilidæ* which have no special form of insect prey, but attack indiscriminately, are not as a rule mimetic. Such an exception as our own *Asilus crabroniformis* recalls in a general way the type of Aculeate colouring and pattern which is commonest and most conspicuous in its region, and is probably therefore independent of the advantages due to special association. Neither do we find mimicry prevalent among the *Asilidæ* which exhibit decided preferences, but not in the direction of specially-defended prey, such, for instance, as *Dysmachus trigonus*, which clearly selected a much less abundant beetle (*Rhizotrogus sauzi* (?), Graells), among the swarms of Orthoptera towards the summit of Peñalara, on July 25, 1902. Mimicry, on the other hand, is common among these predaceous Diptera when they attack the Hymenoptera in any special degree. We can probably distinguish two classes of mimetic resemblances among such Asilid flies. In the first we may place *Dasypogon diadema* and the slender ichneumon-like Dioctrias which, as Colonel Yerbury has observed (l. c., pp. 332, 333), specially select ichneumons as their prey—in fact, all examples in which the attacks are upon a group rather than upon a particular species. The second class, in which mimicry is even more common and more exact in its details, comprises the *Asilidæ* which specially attack single species of Aculeates, such, for instance, as *Damalina* sp., described by Col. C. T. Bingham as preying upon the model (*Melipona apicalis*), which it resembles with extraordinary precision (l. c., p. 334). Further examples are probably to be found in the Hyperechias, which bear so wonderfully perfect a resemblance to the *Xylocopidæ*, and, as is believed, prey upon these Aculeates. Indeed, Mr. E. E. Green has only recently observed one circling round its Xylocopid model in Ceylon (Proc. Ent. Soc. Lond., 1904, June 1). It is unfortunate that the

remarkable likeness to such common insects should convey an impression of extreme rarity and lead to a want of knowledge as to habits. Asilid mimicry of this latter kind may be exactly paralleled by resemblances such as that of the Histerid *Saprinus viresccns* to its distasteful Phytophagous prey, *Phædon cochleariæ*,—following the convincing interpretation offered by Mr. Horace Donisthorpe (Trans. Ent. Soc. Lond., 1901, p. 354).

The resemblance of the Volucellas for the Aculeates has probably been brought about in a slightly different way, although here too the older interpretation of the mimicry as aggressive must, I believe, be abandoned. My friend Dr. W. Hatchett Jackson has recently presented to the Hope Department a specimen of *Volucella inanis*, which he captured on August 29, 1903, close to the entrance of a wasps' nest in his garden at Pen Wartha, Weston-super-Mare. The wasps paid not the slightest attention to it, although they instantly attacked other insects venturing near the opening. Considering that wasps will detect and kill the individuals from other communities, it is most improbable that they were deceived by the appearance of the *Volucella*. Furthermore, Dr. Jackson has had the opportunity of studying M. Fabre's latest volume, and informs me that the great observer believes *V. inanis* to be a beneficial guest in the wasps' nest, feeding on débris, waste substances, excreta, etc. He also states that the larvæ of these diptera are not attacked even when upon the combs of the wasp. These results entirely accord with observations upon *V. bombylans* carried out by the present writer in association with Miss Cora B. Sanders early in July 1898. Fresh and active specimens of the *Volucella* were lightly but securely girdled with a fine silken thread, the other end being attached to a long slender twig. In this way it was possible to guide the movements of the fly and compel it to wander close to the opening of the underground nest of *Bombus terrestris*, and even to enter the passage. Examples of both the red-tailed form of *V. bombylans* and the banded form (var. *mystacea*) were thus tested, and only once was any antagonism displayed. On this occasion the *Volucella* was made to descend the passage, and thus met an ascending worker. The humble-bee grappled with the fly, wrestled with it in a clumsy manner for a few seconds, and then left it apparently without having caused any injury. We also

witnessed the oviposition of the *banded* variety *mystacea* in the nest of a *red-tailed* carder-bee (*Bombus derhamellus*, Kirb.). The fly hovered round the nest for a few seconds, the bees paying no attention to it. It then alighted on the moss and quickly entered, remaining about *eight* minutes. At the close of this period it emerged, and at once flew away. Opening the moss below the point of its entrance and exit, about fifty or sixty eggs were found in a mass. These were exactly similar to the eggs sometimes laid by captured females of the species of *Volucella*. The fact that a banded fly should have laid in the nest of a red-tailed bee strongly opposes the interpretation of aggressive mimicry, originally offered by Kirby and Spence and followed by the present writer in former publications (*c. g.* "Colours of Animals," London, 1890, p. 267).

Another observation made on the same occasion also opposes the older interpretation. It is well known that the Aculeate models, when disturbed, commonly adopt a warning attitude in which the second leg is raised. On further irritation the whole body is generally tilted over on one side. In the sun *Volucella* is shy and readily takes flight; but on cold days and in the evening it becomes sluggish and semi-torpid. If disturbed in this condition I found that it raises its first leg in a manner clearly mimetic of the first warning position of its *Bombus* model. The anterior legs of flies perform such a variety of operations that selection would here have a comparatively easy task to produce a new movement of a simple kind. At the same time the general likeness of the attitudes is very striking, although different legs are made use of by model and mimic.

The protective value of such a detail in the resemblance of fly to *Bombus* becomes sufficiently obvious, when it is remembered that the position is only assumed at a time of complete helplessness. On the other hand, it is most improbable that an attitude thus assumed could play a part in the aggressive mimicry of the one insect for the other.

The facts now brought forward supply a solid foundation for the criticism of the older conclusions urged, in 1893, by Mr. W. Bateson, F.R.S. ("Nature," 1892, Vol. xlvi, p. 585, Vol. xlvii, p. 77).

It is probable that the Volucellas, like the Asilids, are protected from insect-eating animals by their mimetic disguise, and that the resemblance of *V. inanis* to wasps

and of *V. bombylans* to the red-tailed and banded humble-bees have been promoted by the special associations which render the models peculiarly feasible in each respective case. These Diptera live in the same habitats as their models, and may be seen visiting the same flowers; they fly from nest to nest to deposit their eggs, and their first flight on emergence from the puparium is made from the home of an Aculeate community. It is obvious that their mode of life bears a strong superficial resemblance to that of their respective hosts, and that mimetic likeness to these hosts would be far more convincing and advantageous than to other species of Aculeates.

Although mimicry is not necessarily dependent on a mode of life which brings an insect into intimate relationship with some widely-different form possessed of special means of defence, yet such associations are very commonly attended by mimicry. In this note it has been seen that mimetic likeness may result when the relationship is that between captor and prey, whether the prey be defended by a sting or by some nauseous quality—that it may result when the association is that of scavenger to an Aculeate host.

E. B. P.

XXIII. *Additions to a knowledge of the Family* Cicadidæ.

By W. L. Distant.

[Read June 1st, 1904.]

Plates XXIX and XXX.

The following descriptions refer to species of *Cicadidæ* which have reached me from various sources during the last few years. Foremost among these, I may mention a small collection made and forwarded to me by Mr. P. W. Mackinnon, at Mussooree, N.W.P., India, which contained no fewer than five new species, a revelation after the mass of material which passed through my hands a decade ago, when preparing my "Monograph of the Oriental *Cicadidæ*." An undescribed *Cicada* from Bombay has also been sent by Mr. R. M. Dixon. I am indebted to Col. Bingham for two new species collected by Mr. Craddock at Pahang, in the Malay Peninsula, while my friend Dr. Heath has again enriched my collection with a number of new species principally from the Ethiopian region.

Subfamily *CICADINÆ*.

Platypleura mackinnoni, sp. n. (Pl. XXIX, fig. 1, *a*, *b*.)

Head and pronotum ochraceous; head with the lateral margins of front, face—excluding basal spot, anterior lateral margins of vertex, and a broad transverse fascia between eyes including the area of the ocelli, black; pronotum with the basal margin stramineous, its disc with a central longitudinal fascia much broadened at base, and the incisures, black; mesonotum pale castaneous, with two anterior, fused, obconical spots, on each side of which is a longer obconical spot, and a large curved basal spot with its apex prolonged, black; basal cruciform elevation pale castaneous with its central area black; abdomen black, apex and margins of the tympana ochraceous; legs, rostrum, posterior margins of abdominal segments and apical segment (more or less) ochraceous.

Tegmina pale talc-like, the venation ochraceous on basal half, piceous on apical area, extreme basal area piceous; wings pale hyaline, the venation ochraceous, about basal third piceous streaked with ochraceous.

♂. Opercula almost meeting interiorly, their lateral and posterior margins oblique, their apices reaching the base of the second abdominal segment.

Long. excl. tegm. ♂ and ♀. 25 millim. Exp. tegm. 75 millim.

Hab. India; Mussooree—Dehra Dun (*P. W. Mackinnon* —18-6-1903).

Platypleura makaya, sp. n. (Pl. XXIX, fig. 4, *a*, *b*.)

♀. Head, pronotum, and mesonotum brownish-ochraceous; pronotum with two broken and centrally subobsolete longitudinal lines, and the incisures, black; mesonotum with two anterior linear obconical spots, on each side of which is a much smaller angulated spot, and a small round spot in front of the anterior angles of the basal cruciform elevation, black; abdomen above black, the basal central area and margins of the segments brownish-ochraceous; body beneath and legs brownish-ochraceous.

Tegmina opaque, brownish-ochraceous, with greyish mottlings, the most conspicuous of which are two spots in the radial area, a central spot in the two upper ulnar areas, a large central spot on apical margin, and another spot near inner angle, the apical margin is distinctly infuscate; wings castaneous, the margins, abdominal area, veins on basal area, and ray-like spots on outer area pale piceous, a grey spot on posterior margin.

Head including eyes about as broad as anterior margin of mesonotum; lateral margins of pronotum angularly ampliated; rostrum reaching the second abdominal segment.

Long. excl. tegm. ♀. 29 millim. Exp. tegm. 90 millim.

Hab. Congo; Bopoto.

I have not yet seen the male of this species. I am indebted to my friend Dr. Heath for the type.

Platypleura adouma, sp. n. (Pl. XXIX, fig. 2, *a*, *b*.)

♀. Head, pronotum, and mesonotum brownish-ochraceous; head with the area of the ocelli, a radiating line to eyes and two frontal spots, piceous; pronotum with two central longitudinal lines—fused posteriorly, and the incisures black; mesonotum with two central obconical spots on anterior margin, on each side of these a smaller spot, a linear spot followed by a rounded spot on lateral areas, and a spot in front of anterior angles of the basal cruciform elevation, black; abdomen above dark castaneous, the apical margins of some of the segments ochraceous; body beneath and legs brownish-ochraceous.

Tegmina opaque, fuscous, irrorated with brownish-ochraceous, and with piceous mottlings, of which the most prominent are two spots in radial area, and two irregularly-sized spots in the two upper ulnar areas ; the most prominent pale markings are in the radial area, in the two upper ulnar areas, a sub-apical spot, a central spot to apical margin and a spot near inner angle ; wings ochraceous, the outer and posterior margins dark castaneous, the veins and abdominal area fuscous.

Head including eyes slightly narrower than anterior margin of mesonotum ; lateral margins of pronotum ampliated but not angulated; rostrum reaching the fourth abdominal segment.

Long. excl. tegm. ♀. 21 millim. Exp. tegm. 65 millim.

Hab. Congo—no precise locality.

I have two female specimens, but have not seen the other sex.

Ugada præcellens. (Pl. XXIX, fig. 5, *a*, *b*.)

Platypleura præcellens, Stål, Trans. Ent. Soc. Lond., 1863, p. 572.

♀. Head, pronotum, and mesonotum dark obscure olivaceous ; head with two central and two basal-angular spots to front, and vertex with a transverse broken linear fascia between eyes, and a spot behind each eye, black ; pronotum with two small obconical spots on anterior margin, a spot at centre of anterior margin, two discal spots, the incisures, and the anterior area of lateral margins black ; mesonotum with two anterior obconical spots on each side of which are two smaller spots, two discal spots, and irregular spots in front of basal cruciform elevation, black ; abdomen dark ochraceous the anterior segmental margins broadly black ; legs ochraceous-brown, abdomen marked much as above.

Tegmina with about basal half pale green, basal spots, an oblique broad irregular fascia dividing the green area, and almost the whole of the apical half tawny-brown, the last with a few paler spots ; wings dark purplish-brown, with two elongate creamy spots on posterior margin.

Rostrum mutilated ; lateral margins of the pronotum broadly angularly ampliated ; head including eyes much narrower than base of mesonotum.

Long. excl. tegm. ♀. 28 millim. Exp. tegm. 87 millim.

Hab. Sierra Leone.

An unlocalized female specimen here described and figured was presented to me by Dr. E. A. Heath some few years ago. I have waited since that time for further

details as to locality, and for the chance acquisition of a representative of the other sex, but neither of these wishes was gratified. Professor Poulton, however, has now kindly forwarded the type of Stål's species contained in the Oxford Museum, and I am thus enabled to figure his very rare *P. præcellens*.

The description of the genus *Ugada* and some other allied genera will appear elsewhere, almost simultaneously with this paper.

Pycna numa, sp. n. (Pl. XXIX, fig. 3, *a*, *b*.)

♀. Head, pronotum, and mesonotum pale greyish-virescent; a central black longitudinal fascia extending from the ocelli to the base of the pronotum, pronotal incisures more or less black; mesonotum with two obscure anterior obconical spots, two spots in front of basal cruciform elevation, and a fascia on posterior half of lateral margins, piceous; abdomen above piceous, a central fascia, apex, and lateral marginal spots, virescent; body beneath and legs pale greyish-virescent; base and apex of face, apex of rostrum, apical annulation to femora, central annulation to tibiæ, and bases and apices of tarsi, black.

Tegmina with about basal half dull ochraceous, opaque, mottled with brown, a pale lacteous spot in radial cell; apical area pale hyaline or talc-like, the veins ochraceous, and with small fuscous spots and other markings; wings with about basal two-thirds ochraceous, outwardly margined with castaneous, and with some longitudinal rays of the same colour; apical area pale hyaline with the veins ochraceous.

Head including eyes considerably narrower than anterior margin of mesonotum; lateral margins of pronotum strongly angularly produced; rostrum reaching the anterior margin of the fifth abdominal segment.

Long. excl. tegm. ♀. 24 millim. Exp. tegm. 70 millim.

Hab. MASHONALAND; Umtali (*G. A. K. Marshall*).

Mr. Marshall sent me a female specimen a few years ago; as I have not received the male since that time, I now describe the species.

Pycna hecuba, sp. n. (Pl. XXIX, fig. 6, *a*, *b*.)

♂. Head, pronotum, and mesonotum greenish-ochraceous; area of the ocelli, a broken longitudinal fascia, a large spot on anterior lateral margins, and the incisures to pronotum black; mesonotum with two anterior pale castaneous obconical spots, on each side of which is a black spot, and a transverse series of four black spots in

front of the basal cruciform elevation; abdomen above ochraceous, with transverse more or less broken black fasciæ; head beneath, sternum, opercula, and legs greenish-ochraceous; apices of tarsi black; abdomen beneath as above.

Tegmina with about basal third greenish-ochraceous, opaque, mottled with brown and with a transverse brown fascia at its extremity; remaining area semi-hyaline, the veins and other macular markings fuscous; wings with about basal half ochraceous, with a large piceous spot on its outer margin, remaining area semi-hyaline, the veins ochraceous.

Head including eyes much narrower than anterior margin of mesonotum; lateral margins of pronotum strongly angularly ampliated; rostrum mutilated; opercula broad and short, not passing the posterior margin of the first abdominal segment and a little overlapping at their inner angles.

Long. excl. tegm. ♂. 25 millim. Exp. tegm. 73 millim.

Hab. EAST AFRICA; Kikuya.

Cosmopsaltria khadiga, sp. n. (Pl. XXX, fig. 9, *a*, *b*.)

Body somewhat short and broad, brownish-ochraceous; head with transverse fasciate lines to front, and suffusions on disc of vertex, pronotum with two central longitudinal lines and the incisures, mesonotum with two obconical spots on anterior margin, a large discal lanceolate spot between them, a spot on each side of them on anterior margin, a longitudinal fascia, profoundly notched anteriorly, on each lateral area, and a spot in front of anterior angles of basal cruciform elevation, abdomen with base and central spot to first segment, and central anterior margins of second and third segments, black; body beneath and legs pale ochraceous, a spot at inner margin of eyes and spots near base of rostrum, black.

Tegmina and wings pale hyaline, the venation fuscous.

♀. Opercula long, reaching the apical abdominal segment, their apices angularly rounded, outwardly sinuate near base, inwardly slightly convex; face centrally sulcate, transversely striate; rostrum reaching the posterior coxæ.

Long. excl. tegm. ♂. 29 millim. Exp. tegm. 85 millim.

Hab. MALAY PENINSULA; Pahang (*Craddock*).

I have to thank Col. Bingham for the series of specimens on which this species is founded. It is allied to *C. tripurasura*, Dist.

Pomponia surya, sp. n. (Pl. XXX, fig. 2, *a*, *b*.)

Head and mesonotum piceous; pronotum ochraceous; head with an apical spot to front, lateral margins of vertex, and the ocelli,

ochraceous; pronotum with two central longitudinal fasciæ, widened anteriorly and rounded and united posteriorly, the incisures, and large spots on posterior margin, piceous; lateral margins of mesonotum and the cruciform elevation, ochraceous; abdomen brownish-ochraceous, greyishly pilose; body beneath and legs ochraceous, greyishly pilose.

Tegmina and wings pale hyaline, the venation fuscous, the tegmina with the transverse veins at apices of the two upper ulnar areas, infuscated.

♂. Rostrum with its apex piceous and reaching the posterior coxæ; opercula placed distinctly apart, not passing the first abdominal segment.

Long. excl. tegm. ♂. 25; ♀. 21 millim. Exp. tegm. ♂ and ♀. 65 to 66 millim.

Hab. India; Mussooree—5000 ft. (*P. W. Mackinnon*—30–5–1903).

Pomponia melanoptera, sp. n. (Pl. XXX, fig. 3, *a*, *b*.)

Head, pronotum, and mesonotum olivaceous green; head with the anterior margin and a basal triangular spot to front, some reticulate lateral markings to vertex and the area of the ocelli, black; pronotum with the basal and lateral margins dull ochraceous, with two central longitudinal waved black fasciæ, widened on anterior margin, united posteriorly, on each side of these are two oblique purplish spots, and some black marks on the lateral areas; mesonotum with two sets of central obconical spots arranged in pairs, a longer obconical spot on each side, four anterior marginal spots, and a central lateral and apical spot, black; basal cruciform elevation with its apices black; abdomen black, above with a few obscure ochraceous spots and in the male with the anterior margin of the second abdominal segment and a spot at each side of anal segment, white; sternum, rostrum, and legs olivaceous; transverse marginal striæ to face black; opercula piceous.

Tegmina and wings pale hyaline, the first with the costal membrane and basal venation olivaceous, a fuscous spot at apices of ulnar areas, and a smaller fuscous spot a little before apices of veins to apical areas.

♂. Rostrum reaching the third abdominal segment; opercula reaching the second abdominal segment not quite meeting interiorly.

Long. excl. tegm. ♂ and ♀. 20 millim. Exp. tegm. 68 to 70 millim.

Hab. India; Mussooree (*P. W. Mackinnon*—Sept. 1903).

Allied to *P. expansa*, Walk.

Cicada vesta, sp. n. (Pl. XXX, fig. 4, *a*, *b*.)

Head black, a central line to face and anterior narrow margin to vertex, ochraceous; pronotum castaneous, its posterior margin and a central longitudinal fascia margined with black, ochraceous; mesonotum black, two central, discal angulated fasciæ with a spot between them, and the basal cruciform elevation, ochraceous; abdomen above black; body beneath and legs pale ochraceous, greyishly pilose, opercula and anal segment bright ochraceous; apices of tibiæ and tarsi piceous.

Tegmina and wings pale hyaline, the venation ochraceous towards base and fuscous towards apex; tegmina with the costal membrane ochraceous to apex of radial area and thence piceous, the basal cell and narrow bases of both tegmina and wings piceous.

Opercula about half the length of abdomen, their lateral margins somewhat strongly oblique, their apices truncately rounded, their inner margins meeting for about third of length and thence oblique to apices; rostrum about reaching the posterior coxæ.

Long. excl. tegm. ♂. 28; ♀. 22 millim. Exp. tegm. ♂. 80; ♀. 70 millim.

Hab. India; Bombay (*R. M. Dixon*).

Cicada nigrans, sp. n. (Pl. XXX, fig. 1, *a*, *b*.)

Head black, eyes ochraceous; pronotum dark testaceous, with a central black fascia; mesonotum black, with two central linear obconical testaceous spots from which two slender rays emanate on each side; abdomen black, posterior segmental abdominal margins testaceous; body beneath piceous, ochraceously pilose, opercula ochraceous; legs pale castaneous, apices of femora pale luteous.

Tegmina and wings pale hyaline, the venation fuscous or ochraceous; tegmina with the transverse veins at the apices of the three upper ulnar areas infuscated, and a small fuscous spot near apices of longitudinal veins to apical areas.

Opercula overlapping each other internally, rounded posteriorly but not extending beyond the apex of the basal abdominal segment; rostrum just reaching the posterior coxæ; face somewhat strongly transversely striate, and broadly centrally longitudinally impressed.

Long. excl. tegm. ♂ and ♀. 27 millim. Exp. tegm. 75 to 78 millim.

Hab. Madagascar; Fort Dauphine.

Macrotristria nigrosignata, sp. n. (Pl. XXIX, fig. 7, *a*, *b*.)

♀. Body castaneous; posterior margin of pronotum, cruciform

elevation, posterior margins of abdominal segments, and the coxæ ochraceous.

Tegmina and wings talc-like, the venation ochraceous; basal cell, and basal streak to tegmina and extreme base of wings, black.

Face gibbous, obscurely striate; rostrum just reaching the posterior coxæ; anterior femora armed with two long robust spines beneath.

Long. excl. tegm. ♀. 34 millim. Exp. tegm. 100 millim.

Hab. West Australia; Cossack.

I have not seen the male of this fine species.

Subfamily *TIBICENINÆ.*

Hamza, gen. nov.

♂. With the appearance of the genus *Platypleura*, but with the tympana largely uncovered.

Body short, broad; head including eyes about as wide as the anterior margin of the mesonotum; ocelli placed nearer each other than to eyes; pronotum with the lateral margins ampliated, obtusely angulated near middle; anterior femora distinctly tuberculately spined; metasternum slightly elevated, broadly centrally sulcate, and sinuately truncated; tympana only about half covered by the dilated and expanded lateral areas of the basal abdominal segment; opercula short, broad, their apices convexly rounded; tegmina with the basal cell broad, with at least four angles, ulnar veins widely separated at their bases.

Type, *H. bouruensis*, Dist.

Hamza bouruensis. (Pl. XXX, fig. 5, *a*, *b*.)

Platypleura bouruensis, Dist., Ann. Mag. Nat. Hist. (7), vol. i, p. 97 (1898).

This species was originally described from a female specimen, and it is only since I have acquired examples of the male sex that I have seen its great generic division from *Platypleura*, which renders it a member of the *Tibicininæ*. This is an instance so often relied on by some advocates of mimicry, a suggestion, at least in this case, which would certainly not explain a strong case of superficial similarity in evolution.

Hab. Malay Archipelago; Bouru.

Tibicen sankara, sp. n. (Pl. XXX, fig. 8, *a*, *b*.)

♂. Head black, anterior margins and three small basal spots ochraceous, eyes and ocelli castaneous; pronotum castaneous, lateral and posterior margins, and two central spots both on anterior and posterior margins—divided by a pale ochraceous line, black; mesonotum and basal cruciform elevation black, the first with lateral margins and two anterior obconical spots only delineated by their margins, ochraceous; abdomen castaneous, greyishly pilose, the base and a central longitudinal fascia black; head beneath, sternum, and legs ochraceous; abdomen beneath castaneous.

Tegmina and wings pale hyaline, the venation fuscous or ochraceous, their bases narrowly ochraceous, wings with a small fuscous marginal spot near abdominal area.

Rostrum scarcely extending beyond the anterior coxæ.

♀. Body much darker in hue than in ♂; lateral margins of abdomen beneath obscurely piceous.

Long. excl. tegm. ♂. 18; ♀. 20 millim. Exp. tegm. ♂. 47; ♀. 52 millim.

Hab. INDIA; Chamasari—5000 ft. (*P. W. Mackinnon* —May 1903).

Terpnosia ganesa, sp. n. (Pl. XXX, fig. 6, *a*, *b*.)

Body above brownish-olivaceous; head with margins of front, area of ocelli, on each side of which is an oblique line, black; pronotum with two central longitudinal fasciæ, with a spot on each side of same and the incisures, black; mesonotum with two anterior obconical spots, a straight longitudinal fascia continued from between them, a spot at each anterior angle of the basal cruciform elevation, and a broad continuous sub-lateral fascia preceded by a small spot on anterior margin, black; abdomen above irregularly greyishly pilose, the extreme margins of the first and second segments, a central longitudinal spot on first segment, broad discal fascia to third segment, two small central spots on fourth, fifth and sixth segments, and lateral marginal spots, black; body beneath and legs ochraceous, central fascia to face and the rostrum stramineous; apical spots to coxæ, and basal and apical annulations to femora and tibiæ, black.

Tegmina and wings pale hyaline, venation fuscous or ochraceous, the tegmina spotted at apices of ulnar and apical areas.

Rostrum passing the posterior coxæ; opercula oblique, not reaching apex of second abdominal segment, and not meeting inwardly.

Long. excl. tegm. ♂. 26 millim. Exp. tegm. 70 millim.

Hab. India; Mussooree (*P. W. Mackinnon*—15-4-1903).
Allied to *T. maculipes*, Walk.

Terpnosia abdullah, sp. n. (Pl. XXX, fig. 7, *a*, *b*.)

Body pale ochraceous with the following black markings; viz. two small anterior spots and a spot at each basal angle to front, the area of the ocelli, and a line at inner margin of eyes; two central longitudinal lines and the incisures to pronotum, a central line much widened medially, on each side of this an anterior curved line followed by two angulated spots and a large lateral curved spot to mesonotum, a small rounded spot in front of anterior angles of the basal cruciform elevation; lateral margin of first and an oblique marginal spot to second abdominal segment, transverse spots to face, apices of femora, bi-annulations to tibiæ and tarsi, and base and apex of abdomen beneath.

Tegmina and wings pale hyaline, the venation ochraceous; the first with a black spot at base of upper ulnar area, and the transverse veins at the apices of the two upper ulnar areas, infuscated; opercula small and obliquely rounded; rostrum reaching the posterior coxæ.

Long. excl. tegm. ♂. 16 millim. Exp. tegm. 46 millim.

Hab. Malay Peninsula; Pahang (*Craddock*).
Allied to *T. clio*, Walk.

Explanation of Plates XXIX and XXX.

Plate XXIX.

Fig. 1. *Platypleura mackinnoni*.
2. ,, *adouma*.
3. *Pycna numa*.
4. *Platypleura makaga*.
5. *Ugada præcellens*.
6. *Pycna hecuba*.
7. *Macrotristria nigrosignata*.

Plate XXX.

Fig. 1. *Cicada nigrans*.
2. *Pomponia surya*.
3. ,, *melanoptera*.
4. *Cicada vesta*.
5. *Hamza bouruensis*.
6. *Terpnosia ganesa*.
7. ,, *abdullah*.
8. *Tibicen sankara*.
9. *Cosmopsaltria khadiya*.

September 30th, 1904.

XXIV. *Synepigonic series of* Papilio cenea (1902–3) *and* Hypolimnas misippus (1904), *together with observations on the life-history of the former.*

By George F. Leigh, F.E.S. With notes by Professor Edward B. Poulton, D.Sc., F.R.S., and an Appendix by Roland Trimen, M.A., F.R.S.

[Read June 1st, 1904.]

Plates XXXI and XXXII.

I. *Observations on the life-history of* Papilio cenea.

On September 18, 1902, I took a male of *Papilio cenea* in copulâ with a female of the *cenea* form which is commonest in Natal, viz. that which possesses *white* spots on the fore-wing. Having previously discovered the food-plant, I decided to try and obtain eggs. I placed in a large paraffin tin a small example of this plant, and by its side a vase with several of the flowers on which the butterfly feeds, covering all in with mosquito netting. The female *cenea* fed on the flowers, and lived for five days. I then carefully examined the plant and found 90 eggs upon it, but not one on the flowers or the sides of the tin. The eggs are white and very small; they are laid upon both sides of the leaves and upon the small stems of the food-plant. The larvæ began to hatch on September 29, only three of the eggs proving barren. The young larvæ are nearly black in colour, with white on the last segment. The first ecdysis occurred on October 3–5, when 13 of the larvæ died. They were then transferred to another tin with fresh food-plant. In the second stage they are chocolate and white. When not feeding, the larva rests upon a slight web spun over the central part of the leaf. The second ecdysis occurred on October 8–11, after which 70 living larvæ were counted. The colours were as in the second stage, save that the chocolate was of a paler shade. The larvæ fed well and grew rapidly, the third ecdysis taking place on October 13–16. An immense change in appearance is now manifest; for the larvæ of the fourth stage are blue-green, beautifully variegated with white, of which the amount varies greatly in different individuals. All the larvæ passed this ecdysis safely, but four were killed for preservation. The last ecdysis occurred between

October 18 and 26, some of the larvæ lagging behind the others in their rate of growth. Another change is now witnessed; for the larvæ of the last stage are blue-green (exactly matching the food-plant), with small orange spiracular spots and two blue spots invariably present on the third segment, other segments being sometimes similarly marked.

The larvæ began to attach themselves preparatory to pupation on October 27, and continued to mature for about a fortnight. The situation generally selected was a part of the food-plant where a leaf had been eaten completely away; although some pupated upon the netting and some upon the sides of the tin. Six larvæ were killed for preservation, and a certain number failed to pupate; but I obtained 56 healthy chrysalides, all of which were green, exactly matching the shade of the leaves of the food-plant.

The imagines began to emerge November 7, and continued to come out up to the 22nd.

It is often stated that the males of Lepidoptera tend to emerge before the females, a conclusion which my experience by no means confirms. In this case the first two which emerged were both females. I did not keep an account of the emergences after this, but the largest number to appear in one day was 11, of which 7 were females. According to my usual experience with bred specimens there were a larger number of females than males, viz. 27 to 18. The 11 remaining pupæ either dried up or produced cripples.*

All the specimens were smaller than those of the same broods captured in the wild state, and this I trace to the artificial conditions inseparable from the described method of breeding.

In nature the females are far rarer than the males; one might probably see twenty-five of the latter to one of the former. The female, I believe, flies but little in the open except when engaged in oviposition. Only two or three eggs are laid on each plant, and those growing under trees or otherwise in the shade are the most frequented. The

* In future work of this kind when the material bears upon problems in heredity of the utmost importance and complexity, every dead pupa and every crippled specimen should be carefully preserved; for the lens would certainly reveal the sex, while dissection would in many cases reveal the variety.—E. B. P.

larvæ are invariably found on the lower parts of the plant, as near to the ground as possible. They are fairly easy to detect in the chocolate and white stages, but in the last they are the hardest larvæ to find of any with which I am acquainted. The method which I have found to be the best is to knock the plant with the hand, when the disturbed larvæ evert their crimson prothoracic scent-glands. They are then either seen or their presence is revealed by the smell. The pupæ are even harder to find than the larvæ.

My experience with the rare *trophonius* form, mimicking *Limnas chrysippus*, is somewhat limited, but I have succeeded in breeding four examples from captured wild larvæ. I have observed that its pupæ are quite different in colour from those of the other forms. With this exception, the pupæ of all the varieties of *cenea* are simply green, and do not vary in appearance, like those of many of the *Papilioninæ*. The pupa of the *trophonius* form of female was at once distinguished, in the examples which have come under my notice, by a number of brown lateral markings. Of course I am not referring to the usual changes before emergence, when the pattern of the wing can be recognized beneath the thin pupal cuticle, and when, in the case of *cenea*, the male can be easily distinguished from the female.

II. *The Syncpigonic Group bred in* 1902 *from a pair of* Papilio cenea (cenea *form of female*).

It has been already stated that 27 females and 18 males were bred from the parents represented on Plate XXXI, Figs. 1 and 2.

A. *The Female Offspring.*

Not a single example of the brown *trophonius* form, mimetic of *Limnas chrysippus*, appeared among the 27 females, but three were of the *hippocoonoides* form (two of these are represented in Plate XXXI, Figs. 7 and 8) mimicking *Amauris dominicanus*. All the rest were the *cenea* form (four of these are represented in Plate XXXI, Figs. 3–6) mimicking *Amauris echeria*. Of the *cenea* forms three possessed buff-coloured spots on the fore-wing; while probably the whole of the remaining specimens, 21 in number, were the variety which is commonest in Natal, and possesses white spots on the fore-wing, mimicking

A. albomaculata and the examples of *A. echeria* which converge towards it. Two or three cripples were liberated, but they were certainly *cenea* forms, probably white-spotted.

I feel confident that no wild eggs or larvæ were accidentally introduced with the food-plant, but cannot be equally sure about the pupæ. I was not then very familiar with these remarkably cryptic forms, and it is possible that one, or even two or three, may have slipped in unperceived.

Comparison of the Individuals of the 1902 *Synepigonic Group of* Papilio cenea. By E. B. Poulton.

A considerable part of the 1902 material had been dispersed before the present paper was written; but I have made a careful examination and comparison of the whole of the remaining specimens recently presented to the Hope Department by Mr. Leigh. These consist of 8 females (6 *cenea* forms and 2 *hippocoonoides* forms) and 6 males. In the first place it appears possible that the presence of one male and two female (white-spotted Natal *cenea* forms) specimens, which are distinctly larger than the others and also larger than the parents of the group, may perhaps be accounted for by the accidental introduction of wild pupæ with the food-plant.

When the 6 females of the *cenea* form were minutely compared it was apparent that they are not divided into two distinct categories respectively characterized by the buff tint and by the white appearance of the five chief spots of the fore-wing. There was, on the other hand, the most perfect gradation of the one form into the other.

The five chief spots may be indicated by numbers as follows:—

(1) The largest spot, of an oval form, placed below the cell, between the 1st and 2nd median nervules.

(2) A spot, of which the form is usually oval, placed beyond the end of the cell, between the 2nd radial and 3rd median nervules.

(3) A roundish or oval spot, placed beyond the end of the cell, between the 5th sub-costal and 1st radial nervules.

(4) A roundish or oval spot, with its outer border generally marked by a concavity. When the latter curve is strongly marked the spot becomes crescentic (as in Plate XXXI. Fig. 4) or reniform (as in Fig. 3). This spot

is placed beyond the end of the cell, between the 3rd and 4th sub-costal nervules.

(5) The irregular spot within the cell.

The transition from a condition, resembling the female parent, in which the five chief spots of the fore-wing are white, towards one in which they are buff, is clearly seen in the following comparison of the 6 female specimens in this synepigonic group.

I. The largest specimen, unfigured. All five spots white except the edges of (1). The buff tint is especially pronounced on its inner marginal edge —a tendency often manifest in specimens in which this spot is almost entirely white.

II. A slightly smaller specimen, unfigured. (1) *very* pale buff, (3) still paler. The latter not uniformly tinted. At a little distance both spots appear to be white.

III. The specimen represented on Plate XXXI, Fig. 3. (1) distinct buff, (3) and (5) *very* pale buff, the tint of (3) being even fainter than in the specimen last mentioned. At a little distance all spots except (1) appear to be white.

IV. The dwarfed specimen represented in Fig. 5. The condition is similar to that described in No. III, except that spot (3) is of a very slightly deeper shade. Nevertheless, at a little distance all the spots appear to be white except (1).

V. The specimen represented in Fig. 4. (1) buff of a slightly deeper shade than in specimen No. III. (3) very distinct buff. (5) outer half of the area distinct buff. The lens shows traces of the same tint on (2) and (4), but to the eye these two spots and the costal (or inner) half of (5) appear to be white.

VI. The much-dwarfed specimen represented in Fig. 6 All spots except (4) buff, with an appearance of additional depth of tint caused by the over-spreading of dark scales—an encroachment of the ground-colour of the wing. (4) appears to be white or *very* pale buff at a little distance, and is much less overspread than the others. The depth of the shade of buff is most marked in (1), then in (2), (5), and (3) in this order.

The dwarfed condition of specimens 4 and 6 is worthy

of attention, inasmuch as it is possible that the shock of abnormal conditions may have favoured slight reversion to a relatively ancestral form. It has been similarly observed that a set of abnormally small specimens of *Limnas chrysippus*, var. *dorippus* (= *klugii*), from Machakos Road, British East Africa, exhibited an unusual amount of reversion towards the type form of the species (Trans. Ent. Soc., 1902, p. 483).

The very distinct di- and trimorphic forms of some of the chief Ethiopian mimics of *Limnas chrysippus* are still connected by transitional varieties which have been lost or are at any rate unrepresented in the primary model. Hence it has been argued that "*A Study of Mimetic Forms may enable us to reconstruct the Lost Stages through which the Older Model has passed*" (Trans. Ent. Soc., 1902, p. 482). In this case also it is seen that uninterrupted transition obtains between the *cenea* forms of the female mimic with white spots on the fore-wing and those with buff. In the Danaine models, on the other hand, there is a sharp break between the white-spotted *Amauris albomaculata* and the buff-spotted forms of *A. echeria*, and even between the white and the buff varieties of the latter species. It is in every way probable that here too the transition which is witnessed in the younger mimic formerly existed, but has finally disappeared in the older model—viz. the two forms of *Amauris echeria*. As regards the origin and history of the differences between the two *species* which act as models—viz. *albomaculata* and *echeria* —the interpretation is at present less clear and convincing.

It is unnecessary to describe the two *hippocoonoides* forms of females. A glance at Plate XXXI, Figs. 7 and 8, will show that the pattern is typical, although the size is abnormally small, especially in one specimen (Fig. 7).

A careful comparison of the male individuals in the 1902 synepigonic group leads to equally interesting results. In this investigation I have confined my attention to the most distinctive feature of the pattern—the inner black band of the hind-wing. It will be seen that this marking is subject to remarkable individual variation in males of one family. At the same time it is the character by which the males of certain forms of the *Papilio dardanus* (*merope*) group are usually discriminated. It will be convenient to describe the appearance of the band in the best-known forms, before proceeding to record

the individual differences between the males of a single family of the same form.

The inner row of black patches on the hind-wing of the ancestral *Papilio meriones* from Madagascar is usually broken by two gaps, one between the 2nd sub-costal and the discoidal nervule, the other between the 2nd and 3rd median nervules. The former may be conveniently spoken of as "the costal gap," the latter as "the inner gap." The costal gap is often partially and sometimes completely closed by a sickle-shaped black marking, with its concavity directed inwards. The broadened base of this marking, present in all the specimens I have examined, arises from the black patch placed between the discoidal and 3rd median nervules. The inner gap is often partially filled by a detached black spot. This description applies to females as well as to males, although the black markings are more often developed and tend to be more completely developed in the gaps of the first-named sex.

The male of *P. dardanus* (= *meropc*) from the West, or rather the tropical forest (for it extends at least to the N.-E. shores of the Victoria Nyanza), is very similar to that of *meriones* in the characters here described; but the gaps are on the whole wider and less frequently occupied by spots. The base of the sickle-shaped marking is, however, generally present. In the male of *P. antinorii*, from Abyssinia, the band is even more interrupted than in *merope*.

In the male of the Eastern and Southern *P. cenea* both gaps are usually filled, and a continuous broad black band extends from the inner to the costal margin, nearly parallel with the general trend of the hind-margin. This band, which is by far the most prominent feature of the hind-wing, tends to reach a fuller development in males from the northern section of the insect's range along the Eastern coast as compared with males from the southern section. Nevertheless, even in the specimens with the heaviest markings the position of the inner gap is clearly indicated by a bay on the hind marginal border, rendering the band narrowest at this point. Occasionally, too, even in specimens from Mombasa, a small yellow spot, or scattered yellow scales invading the band from within, mark the position of the costal gap.

In examples from Natal and the Southern part of Cape Colony the gaps are far more frequently and more fully

indicated. The mark corresponding to the sickle is not bent in a curve but at a right angle.

Meriones and *antinorii*, with non-mimetic females resembling the males (also accompanied by mimetic females in the case of *antinorii*), are certainly ancestral as compared with other forms of the group, and therefore it is almost equally certain that the interrupted black submarginal band of the male is ancestral as compared with the continuous band.

The submarginal bands of the 6 males of the 1902 synepigonic group may be briefly compared as follows:—

Specimen 1.—Costal gap distinctly indicated, but closed by a broad sickle. Inner gap indicated by narrowing of band.

Specimen 2.—Costal gap closed by a narrow sickle. Inner gap as in 1, but slightly less narrow.

Specimen 3.—Costal gap open: inner much narrowed.

Specimen 4.—Costal gap closed by a narrow sickle: inner still more narrowed than in 3.

Specimen 5.—Costal gap indicated only by a slight narrowing (less marked than in any other specimen). Inner gap open, with faint traces of narrow band.

Specimen 6.—Costal gap closed by a narrow sickle: inner open, with a small detached spot midway between the nervules which form its boundaries. This specimen is much dwarfed, and it is possible that the marked discontinuity of the band may be due to reversion, brought about by the shock of abnormal conditions.

The appearance of the band in the male parent is clearly indicated in Plate XXXI, Fig. 2. The costal gap is closed by a sickle intermediate in breadth between those of the above-described specimens 1 and 4. The inner gap, only preserved on the left side, is more freely open than in any of the offspring.

The male parent (see Plate XXXI, Fig. 2) is, I believe, somewhat less heavily marked in this respect than is usual in the Southern form of *P. cenea*, and the offspring are upon the whole also less heavily marked. At the same time, they exhibit very interesting individual variations, never quite reaching the open condition of the inner gap in the parent, but in half of the examples going beyond their parent in the degree of development of the costal gap.

The evident hereditary tendencies displayed in these males, together with their marked individual differences, are of especial importance in relation to the study of the wonderful series of modifications which are encountered when we trace the allied forms of this remarkable *Papilio* from the coast of British East Africa, westward into Uganda, and north-westward into Abyssinia. In any such investigation we must reckon with the fact that individuals of the same synepigonic group are now proved to exhibit great variation in the degree of continuity of the most prominent feature in the hind-wing. E. B. P.

III. *The Synepigonic Group bred in* 1903 *from a captured female of* PAPILIO CENEA (TROPHONIUS *form of female*).

I succeeded in capturing one of these rare forms of the female in the neighbourhood of Durban on September 18, 1903. Both wings on the right side were slightly but distinctly smaller than those on the left (see Plate XXXI, Fig. 9). From this butterfly only seven eggs were obtained, and only five larvæ successfully reared. It is certain that the experiment was not in any way vitiated by the introduction of wild eggs, larvæ, or pupæ. Two of the larvæ pupated on October 19, one on October 20, and two on October 23. The butterflies emerged on the following dates:—

Nov. 2. 1 ♀ *cenea*-form (Plate XXXI, Fig. 10).
„ 3. 1 ♂ (Fig. 14).
„ 4. 1 ♂ („ 13).
„ 6. 1 ♂ („ 12).
1 ♀ *cenea*-form (Fig. 11).

Thus both the female offspring of the rare *trophonius* form were examples of the commonest of all Natal varieties.

Comparison of the Individuals of the 1903 *Synepigonic Group of* PAPILIO CENEA. By E. B. POULTON.

The first of the females to emerge is rather smaller than the other (Plate XXXI, Fig. 10). Spot (1) is unusually small for an insect of this size (compare Figs. 3, 4, and 11), being not only greatly reduced by encroachment of the ground-colour but also overspread with scattered dark scales. The specimen is a white-spotted variety very similar to female II. of the 1902 group. The appearance of spot (5) is, however, the same as in female III.

The second female is represented on Plate XXXI, Fig. 11. It is seen that the left hind-wing is somewhat crippled. The specimen is a typical white-spotted form of *cenea*, similar to female I. of the 1902 group, but having an even smaller development of the buff tint on the inner marginal border of spot (1).

It is unnecessary to describe the three male offspring in detail; inasmuch as the form of the band and the development of the gaps are clearly shown in Plate XXXI, Figs. 12–14. It is obvious, on a glance at the figures, that the inner gap is open in two specimens (Figs. 13 and 14), and only interrupted by a faint imperfect band in the third (Fig. 12). The costal gap, although not entirely open in any specimen, is strongly indicated in all three.

The condition of the band in the males of these two groups raises the question, which was previously suggested (see pp. 681, 682) by the dwarfed female represented in Fig. 6, as to whether any of the conditions associated with breeding from the egg in confinement may not favour reversion towards the more ancestral form of *meriones* and *meropc*. It must be repeated that this is but a conjecture which would require the examination of a longer series of captured specimens and a far larger number of bred specimens in order to confirm it. It is, however, suggested as a possibility in certain cases by a study of the limited amount of material at my disposal.

The proportion of the various forms of the female in these two groups of offspring (1902 and 1903), and especially the absence of *trophonius* from both, raises an interesting question as to their proportion in nature. Existing records do not enable us to arrive at certain or exact conclusions, but the following data are sufficiently in agreement to justify a rough estimate.

Mr. G. F. Leigh informs me that in a good season in the neighbourhood of Durban, from 25 to 30 males might be met with in a single day; but some of these would be the same insect encountered more than once. During the last season (1903) Mr. Leigh did not see more than 30 females altogether, and of these 2 were the *trophonius* form. Inquiring the experiences of others in the same period of time, he heard of only one other specimen of the latter variety.

Mr. G. F. Leigh recognizes a second form of *hippocoonoides* with "chalky-white" markings similar to, and, as

he thinks, mimetic of *Euralia wahlbergi*. This Mr. Leigh describes as rarest of all the forms of *cenea*. It has been already pointed out that in certain respects the *hippocoonoides* form of *cenea*, and the *hippocoon* form of the Western *merope* respectively, resemble their Nymphaline co-mimics *Euralia wahlbergi* and *E. anthedon* far more closely than the primary models *Amauris dominicanus* and *A. niavius* (Trans. Ent. Soc. Lond., 1902, p. 486, *footnote*). The existence of this chalky-white form indicates an interesting approach towards the co-mimic in another character.

Mr. Guy A. K. Marshall, in sending an estimate of the proportionate occurrence of the three chief forms of the female *cenea* in Natal, warns me that he is only giving a very general impression based on a limited and now long-past experience. His estimate is as follows:—

Cenea	10
Hippocoonoides	4
Trophonius	1
	15

Mr. Roland Trimen, F.R.S., wrote as follows:—

"November 23, 1903.

"At Knysna (where I was out in the district almost every day for about eight months) I saw only 2 *trophonius*, both of which I captured. In Natal, I saw no *trophonius* during four months of almost daily collecting; I have received at long intervals 3 examples from there—1 taken *in copulâ*. I also received from Plettenberg Bay (Knysna District) 3 examples, 1 from East London, and 1 (a variety with fulvous instead of white sub-apical bar to fore-wing) from Bathurst;—all in Cape Colony. *Hippocoonoides* I never saw in the Knysna District, but have received 2; in Natal I saw and took 2 only, but have received 4 from there. *Cenea*, on the contrary, under one or other of its two forms was pretty frequent, but not nearly so much so as the male—owing to less active habits, no doubt."

"December 28, 1903.

"As regards the proportionate numbers of the forms of ♀ *P. cenea*, in say 100 specimens. I can only make a ROUGH GUESS as follows:—

Cenea (true)	50
„ (white-spotted)	40
Grades between *cenea* (white-spotted) and *hippocoonoides*	4
Hippocoonoides	2
Grades between *hippocoonoides* and *trophonius* . .	3
Trophonius	1
	100

"In this matter the preponderance of *cenea* proper in its two forms is to be expected, because its model *Am. echeria* in two forms is practically the only *Amauris* found in *South* Africa—neither *A. dominicanus* nor *A. ochlea* being at all prevalent even on the Natal coast, and not extending further South. But the rarity of *trophonius* is not easy to account for, if *D. chrysippus* is its model; the latter being numerous and generally distributed. It seems possible that *trophonius* was originally modified in mimicry of *Aletis helcita* in *West* Africa (the Abyssinian extremely rare *ruspinæ* ♀ of *Pap. antinorii* lends support to this view); but, curiously enough, *trophonius* appears to be decidedly rare on the W. Coast as well as in other parts of Equatorial Africa, where *Aletis* is abundant. A single very fine *trophonius* was in Hobley's E. African collection; it was of the *West* African character, but in several marked features much more like *D. chrysippus* than like *Aletis helcita*."

"March 19, 1904.

"It is most difficult to believe that such close mimickers as the second and third females of *antinorii*, the *planemoïdes* female of *merope*, or even (in a less degree) the *trophonius* female of *cenea*, can be as rare as they seem to be. Such admirable mimickers *ought* to be no rarer than the *hippocoon* female of *merope*, or the *cenea* female of *cenea*. It must be remembered that all the females of the group in continental Africa *seem* to be much rarer than the males, yet in the few cases of breeding *P. cenea*—on a very limited scale—there seems to have been no marked disparity in the number of the sexes." *

Mr. Trimen has kindly contributed an Appendix (see p. 691), setting forth the characters and arrangement of this interesting and puzzling group of Papilios. E. B. P.

* See p. 678.

IV. *The Synepigonic Group bred in* 1904 *from a captured female of* HYPOLIMNAS MISIPPUS *intermediate between the type form and the var.* INARIA.

The parent (Plate XXXII, Fig. 1), captured near Durban on January 2, 1904, possesses the white sub-apical bar of

No.	Date of Pupation.	Date of Emergence.	Variety.
1	——— 1904	Feb. 2, 1904	♀ *misippus* (Plate XXXII, Fig. 2).
2	——— ,,	Feb. 2, ,,	♂ smallest male (Fig. 8).
3	Jan. 28, ,,	Feb. 3, ,,	♂ largest male (Fig. 7).
4	Jan. 27, ,,	Feb. 3, ,,	♀ *misippus*, sub-apical white bar of fore-wing similar to that of No. 1.
5	——— ,,	Feb. 4, ,,	♂
6	Jan. 28, ,,	Feb. 4, ,,	♀ *misippus*, sub-apical white bar of fore-wing similar to that of No. 14.
7	——— ,,	Feb. 4, ,,	♂
8	——— ,,	Feb. 4, ,,	♀ like parent, but white bar obscured by brown scales (Fig. 3).
9	——— ,,	Feb. 4, ,,	♀ *inaria*, with bar unusually distinct but brown (Fig. 5).
10	——— ,,	Feb. 5, ,,	♀ *inaria*, similar to No. 12.
11	——— ,,	Feb. 5, ,,	♂
12	Jan. 30, ,,	Feb. 5, ,,	♀ *inaria* (Fig. 6).
13	——— ,,	Feb. 5, ,,	♂
14	Feb. 2, ,,	Feb. 8, ,,	♀ *misippus* (Fig. 4).
15	——— ,,	Feb. 8, ,,	♂
16	——— ,,	Feb. 11, ,,	♂

misippus, although the partial replacement of the black ground-colour of the apex of the fore-wing approaches the

condition found in *inaria*. It is a well-known but not very common variety, of which there are several examples in the Hope Department. Forty-one eggs were laid by this female, and the larvæ hatched on January 9 and 10. They proved to be difficult to rear during the smaller stages, when the larvæ were often buried in the moist fæces produced by the extremely succulent food-plant. The surviving larvæ were however quite healthy, and the imagines with few exceptions of the normal size. The results of the experiment are shown on preceding page in a tabular form.

Comparison of the Individuals of the 1904 *Synepigonic Group of* Hypolimnas misippus. By E. B. Poulton.

Only a single female out of eight resembled the parent, and even this was a less-pronounced variety. Of the rest, four were typical *misippus*, three typical *inaria*—one of the latter indicating some slight approach in the direction of the parent.

Thus a tendency is revealed which if general must lead to a gradual reduction in the numbers of the intermediate varieties, and an increasingly abrupt break between the *misippus* and *inaria* forms of female. In this instance the intermediate variety had little power to impress its own form on the next generation; for seven out of eight of its female offspring broke up into the two well-known and sharply-separated forms. Although the transition between *misippus* and *inaria* is far more complete than between its models *chrysippus* and *dorippus* (=*klugii*), in correspondence with the fact that a combination of mimetic forms *must* be younger than their models (Trans. Ent. Soc. Lond., 1902, pp. 482–4), the mimic has nevertheless made a considerable advance towards the abruptly-dimorphic condition of the Danaine butterfly which it resembles.

It is unnecessary to describe the male offspring which were entirely normal in appearance, and as a rule in size. The largest and smallest specimens are represented on Plate XXXII, Figs. 7 and 8. E. B. P.

Appendix by Roland Trimen, F.R.S.

The *Merope*-group of the Genus *Papilio*.

A	B	C
♂ and ♀ alike in colouring and marking, and both with the hind-wings tailed.	♂ and one form of ♀ as in Section A; but also two other forms of ♀ totally unlike ♂, and (except in retaining the tails of the hind-wings) closely mimetic respectively of *Amauris* and of *Danais* (and *Aletis*).	♂ retaining same form, colouring, and pattern as in Sections A and B; but polymorphic ♀ presenting four forms (with various intermediate grades), all unlike ♂, all without tails on the hind-wings, and (with the apparent exceptions of the form *dionysos* and another which are least divergent from the ♂) closely mimetic respectively of *Amauris*, *Danais* (?also *Aletis*), and *Planema*.
1. *Papilio humbloti*, Oberth. Both sexes with a well-developed black costal border in the fore-wings terminally truncate at about ⅔ of length of discoidal cell; but in ♀ this border is more or less broadened, and diffusedly expanded to its termination. [This species is further distinguished from all others in the group by both sexes having on the upper-side the black band of the hind-wings *hind-marginal*, like the black border of the fore-wings.] *Hab.* Comoro Islands.	3. *Papilio antinorii*, Oberth. I have not seen any figure or proper description of the ♂, but from Oberthür's brief mention in his account of Antinori's collection, I gather that this sex has less black about it than any other ♂ of the group. From the figures of the ordinary ♀ respectively given by Oberthür and Haase, there must be even more variation in the size of the costal black border in the fore-wings than is shown either by *P. humbloti* ♀ or by *P. meriones* ♀,—Oberthür's figure making this feature very narrow indeed, while Haase's figure represents it as forming terminally a very broad oblique bar extending very nearly to the origins of the 2nd and 3rd branches of the median nervure. ♀, 2nd form, *niavioides*, Kheil. } Only one example recorded of each of these forms! ♀, 3rd form, *ruspinæ*, Kheil. } *Hab.* Abyssinia.	4. *Papilio merope*, Cram. ♀, 1st form (nearest known to ♂, but rare), *dionysos*, Doubl. ♀, 2nd form (prevalent generally), *hippocoon*, Fab. ♀, 3rd form (rare), *trophonius*, Westw., variation. ♀, 4th form (very rare), *planemoïdes*, Trim. *Hab.* Western, Central and Eastern Tropical Africa. 5. *Papilio cenea*, Stoll. ♀, 1st form (nearest known to ♂), unnamed. [Only example known to me is from "Zanzibar," in the Hope Collection.] ♀, 2nd form (not common), *hippocoonoides*, Haase (=*tibullus*, ♀, Kirby). ♀, 3rd form (rare), *trophonius*, Westw. ♀, 4th form (prevalent), *cenea*, Stoll. *Hab.* Eastern South-Tropical and Southern Extra-Tropical Africa.
2. *Papilio meriones*, Feld. ♂ with a variable but always much thinner (and brownish-tinged) costal edging in the fore-wings than is shown by *P. humbloti*; ♀ also variable in this character—which is, however, always as well developed as in ♀ *P. humbloti*, and sometimes considerably broader. *Hab.* Madagascar.		R. TRIMEN. 17/iii/1904.

Note.—I have not followed Aurivillius (*Rhop. Æthiop.*, 1899, p. 464) in associating with this group *Pap. nobilis*, Rogenh. On examination of specimens of both sexes of this species—kindly lent to me by Dr. Jordan of the Tring Museum—it is perfectly clear that, notwithstanding the general superficial resemblance borne by *P. nobilis* to the more primitive forms of the *Merope*-group, it differs too widely from the latter, alike in structure, colouring, and system of markings, to be placed with them. The butterfly exhibits, however, so many features in common with those of the *Hesperus*-group, that, if not included in this group, it should constitute a separate one in the immediate proximity.

Explanation of Plate XXXI.

All the figures are represented slightly more than half the natural size.

Two Synepigonic Groups of *Papilio cenea* together with their parents—a *cenea* form and a *trophonius* form respectively.

Fig. 1. The female parent of the 1902 group, captured *in copulâ* with the male represented in Fig. 2. The butterfly represented in Fig. 1 is a typical white-spotted Natal *cenea* form. A selection of the female offspring is shown in Figs. 3–8.

2. The male parent. The prominent black band of the hind-wing is rather less heavily marked than is usual in Southern forms. This feature was inherited by the male offspring.

3. Female offspring of the *cenea* form described as III. in this memoir. A white-spotted Natal form showing some transition towards the buff-spotted variety.

4. Female offspring of the *cenea* form, described as V. Rather more transitional towards the buff-spotted form than III.

5. Dwarfed female offspring of the *cenea* form, described as IV. Intermediate between the females represented in Figs. 3 and 4.

6. Much-dwarfed female offspring of the *cenea* form, described as VI. The specimen represented is nearest to the typical buff-spotted Southern form of female *cenea*.

7 & 8. Two female offspring of the *hippocoonoides* form. Both typical except for their stunted size, especially marked in Fig. 7.

9. The female parent of the 1903 Synepigonic group captured near Durban on Sept. 18, 1903. It is seen to be a typical *trophonius* form. From this female seven eggs were obtained, yielding the five imagines represented in Figs. 10–14.

10. Female offspring of the *cenea* form: a white-spotted variety similar to the female described as II. in the 1902 family. The chief spot (1) of the fore-wing is unusually small.

11. Female offspring of the *cenea* form: a typical white-spotted variety similar to I. of the 1902 family.

12–14. The male offspring.

Explanation of Plate XXXII.

All the figures are represented nearly $\frac{4}{5}$ of the natural size.

A variety of *Hypolimnas misippus* ♀, together with types of the offspring reared from its eggs.

Fig. 1. The parent. Captured Jan. 2, 1904, at Durban, Natal. Laid 41 eggs, from which 16 butterflies were reared. Examples of all varieties among the offspring are represented in the remaining figures of this plate.

2. Female. Form *misippus*. Emerged from the pupa Feb. 2, 1904. Another female with the sub-apical white bar of a very similar shape emerged Feb. 3, 1904 (pupated Jan. 27).

3. Female. Form intermediate between *misippus* and *inaria*, resembling parent except that the white sub-apical bar is much obscured by scattered brown scales, the difference being greater than is indicated by a comparison of figures 3 and 1. This is the only one of the offspring which resembles the parent at all closely. Emerged Feb. 4, 1904.

4. Female. Form *misippus*. Emerged Feb. 8, 1904 (pupated Feb. 2). Another female with the sub-apical white bar of a very similar shape emerged Feb. 4, 1904 (pupated Jan. 28).

5. Female. Form *inaria*. A slight approach towards the parental form is seen in the sharp and distinct outline of the sub-apical bar, which however possesses the normal brown shade of *inaria*. Emerged Feb. 4, 1904.

6. Female. Form *inaria*. Emerged Feb. 5, 1904 (pupated Jan. 30). Another similar female emerged Feb. 5, 1904.

7. Male. Emerged Feb. 3, 1904 (pupated Jan. 28). The largest of the eight male offspring.

8. Male. Emerged Feb. 2, 1904. The smallest of the eight male offspring. The six unfigured males emerged on Feb. 4 (two ; one small), Feb. 5 (two ; one of them rather small), Feb. 8, and Feb. 11.

XXV. *New species of African* Striphnopterygidæ, Notodontidæ, *and* Chrysopolomidæ *in the British Museum*, described by Professor Christopher Aurivillius, Hon. F.E.S., F.M.Z.S., etc.

[Read October 5th, 1904.]

Plate XXXIII.

The species here described have been forwarded to me for identification by Sir George F. Hampson, together with some others already known to science.

Family STRIPHNOPTERYGIDÆ.

Subfamily *STRIPHNOPTERYGINÆ.*

1. *Phiala simplex*, n. sp. (Plate XXXIII, fig. 1.)

Frons, palpi, abdomen and under-side of thorax ochre-yellow ; outside of palpi, tibiæ and tarsi black ; vertex of head and throat yellowish-white ; upper-side of thorax pure white ; wings above snow-white, beyond middle about 6 mm. from the margin with a fine transverse line composed of black scales. This line is nearly erect in fore-wing, gently arched and somewhat waved in hind-wing. Wings below yellowish-white with all the veins distinctly yellow.

Expanse 46 mm.

Brit. C. Africa, Zomba (*Johnston, Manning*), 1 ♂, 1 ♀; Mashonaland, Umtali (*G. A. K. Marshall*), 1 ♂, type (*H. B. Dobbie*), 1 ♀.

A broad-winged species, easily distinguished by the black line, which is continued from fore-wing directly on hind-wing. (The male from Zomba has a patch of black scales in cell of fore-wing and the black line on hind-wing is absent.—G. F. H.)

2. *Phiala marshalli*, n. sp. (Plate XXXIII, fig. 2.)

Frons, palpi, pectus, legs and abdomen ochre-yellow ; fore-tibiæ and tufts at the sides of the ventral surface of abdomen black, tarsi ringed with black ; vertex of head, upper-side of thorax and wings very pale sulphur-yellow or seldom pure white ; fore-wing above beyond middle with 7–8 black spots on the veins 1–7 and the fold in the submedian interspace ; the spots are disposed in an oblique,

nearly straight or slightly incurved line ; hind-wing beyond middle with a nearly straight, transverse series of 6–7 small black spots ; under-side of both wings yellowish, apical area of fore-wing more or less suffused with ochreous.

Expanse 35–41 mm.

Mashonaland, Umtali (*G. A. K. Marshall*), 3 ♂, 1 ♀ ; 1 ♂ also received from Mr. Marshall is in Mus. Holmiæ ; also 3 ♂ and 1 ♀ in the Brit. Museum, which are nearly white above.

This species is nearly allied to *Ph. costipuncta*, H. Sch. The wings are however destitute of black scales above except in the spots on the veins. *Ph. dasypoda*, Wallengn., which also has distinct dark spots on the veins, has a different greyish ground-colour of the wings.

3. *Phiala fuscodorsata*, n. sp. (Plate XXXIII, fig. 3.)

Collar, head, pectus and legs pale ochre-yellow ; fore and mid-tibiæ and tarsi ringed with black; abdomen dull ochraceous ; thorax above greyish-white with many blackish hairs along the middle ; wings above greyish-white, fore-wing with an oblique, slightly outcurved black line from the middle of the hind-margin to the costa near apex, broader at the hind-margin, thickened at the veins and broken into spots at apex ; there are also many black scales on the median and submedian veins between the base and the transverse line ; hind-wing beyond middle with a slightly curved series of black spots ; wings below pale yellowish without black markings ; cilia white.

Expanse 34 mm.

Brit. E. Africa, Athi ya Mawe (*E. S. Betton*), 6 ♂, 6 ♀, type. Nairobi Plains (*R. Crawshay*), 1 ♂.

(The female has considerably more black irroration on the fore-wing, especially on the veins; in the hind-wing the black spots almost form a line and there is some irroration on termen.—G. F. H.)

4. *Phiala abyssinica*, n. sp. (Plate XXXIII, fig. 4.)

Frons between the eyes, palpi, legs and hind part of pectus yellow ; tarsi ringed with black ; fore part of pectus densely clothed with dark purplish-brown hairs ; sides of pectus white ; vertex and thorax above whitish with some black hairs in the middle ; abdomen deep ochraceous ; wings above greyish-white densely irrorated with large black scales, except at costa of fore-wing and at base of hind-wing ; the veins are also nearly destitute of black scales ; the black

scales in fore-wing condensed to a broad curved stripe from near apex to middle of hind-margin ; there are also black spots on the veins of hind-wing more or less indicated ; cilia broad greyish-white ; wings below yellow suffused with black in the disk.

Expanse 48 mm.

Abyssinia, Zegi Tsana, May, June, 1902 (*Degen*), 6 ♂, 2 ♀, type.

Distinctly allied to both the foregoing species but so abundantly dusted with black scales as to becoming nearly blackish above.

(The female has much less black irroration on both fore- and hind-wings.—G. F. H.)

5. *Stibolepis hologramma*, n. sp. (Plate XXXIII, fig. 7.)

Greyish-white ; a tuft at the base of the antennæ, palpi, pectus, abdomen and legs ochraceous ; a small tuft at each side of the frons, fore and mid-tibiæ, all the tarsi and two lateral rows of black spots on the under-side of abdomen black ; fore-wing above dusted with black scales and adorned with eight distinct waved transverse nearly erect lines, four before the middle, two nearly in the middle and two in the marginal area, the latter more irregular and deeply incurved at vein 5 ; hind-wing above nearly without black scales from base to middle, between middle and external margin with five transverse waved lines and sparingly dusted with black scales ; wings below yellowish-white, from middle suffused with black scales, partly forming indistinct transverse lines ; cilia greyish-white.

Expanse 55 mm.

Mashonaland (*H. B. Dobbie*), 1 ♂, type ; Umtali (*G. A. K. Marshall*), 2 ♂, 1 ♀.

This beautiful species is easily distinguished from *S. abluta*, Holl. by the many complete transverse lines of both wings and the white colour of the frons.

Subfamily *JANINÆ*.

6. *Camerunia* (?) *flava*, n. sp. (Plate XXXIII, fig. 5 ♂, 6 ♀.)

Head, thorax and under-side of abdomen greyish-yellow (♂) or orange-yellow (♀) ; upper-side of abdomen black with a dorsal crest of long yellow hairs and with the hind-margin of segment 2–6 densely clothed with orange-red cilia, the black colour somewhat sprinkled with yellow hairs ; tarsi, middle and fore-tibiæ as well as the branches of the antennæ blackish ; wing pale greyish-yellow (♂) or orange-yellow (♀), on the under-side with two arched transverse

fuscous lines (the first nearly even at the middle and the second somewhat undulate half-way between the middle and the margin), and a very fine marginal line; these lines are faintly shining through on upper-side; in the male there is an indistinct pale brownish-yellow transverse line in the middle on upper-side.

Expanse 68 (♀), 74 (♂) mm.

NYASSALAND, Zomba, 1 ♀; Tanganyika, 1 ♀; Stevenson road on the plateau between Nyassa and Tanganyika, 2 ♂, type.

(The female from Tanganyika is much greyer with hardly a trace of the outer line on either wing.—G. F. H.)

This peculiar species agrees well with my definition of the genus *Camerunia*,* except by vein 8 of fore-wing running to the margin below apex, by vein 3 being more distant from 4 and especially by vein 5 of both wings being, especially in the female, emitted much nearer 4 than 6. The male has on each side of first ventral segment a large opening surrounded by an elevated rim; these openings are also present in the male of *C. albida*. The male of *C. orphne* I am not able at present to examine.

Genus VIANA.

Viana, Wlk., Proc. N. H. Soc., Glasgow, i, p. 340 (1869). Type *velutina*, Wlk., from the Congo.

Proboscis aborted (?). Palpi porrect, reaching a little beyond the frons, densely scaled in the male; last joint very short. Antennæ reaching the apex of the cell, bipectinate; branches rather long in the male, short in the female. Fore-tibiæ unarmed, hind-tibiæ with four spurs. Wings rather broad, more densely scaled in the male than in the female. Fore-wing: apex broadly rounded; outer margin very convex; vein 3 from well before angle of cell but nearer to 4 than 2; 5 from a little nearer to 4 than 6, 6 from 7 near angle of cell, 7 and 8 stalked together from 9, 10 absent, 11 free, from cell close to its apex but soon anastomosing with 12, which approaches very near to cell; lower discocellular straight and erect, middle discocellular gently curved, oblique, half as long again as lower discocellular. Hind-wing: neuration as in *Phasienecus* but vein 8 nearly approaching to cell before middle; hind-margin somewhat produced and obtusely angulated at vein 4 in male, rounded in female. Frenulum and retinaculum absent. Differs from all the allied genera by vein 11 of fore-wing being free from the cell but soon anastomosing with 12.

* Bih. Vet. Akad. Handl., 27 :4, No. 7, p. 26, 1901.

7. *Viana crowleyi*, n. sp. (Plate XXXIII, fig. 9, 9*a*.)

♂. Palpi, head, thorax, abdomen, fore-tibiæ and tarsi above pale reddish-brown more or less tinged with fuscous; legs, breast and under-side of abdomen and wings ochre-yellow; fore-wing above dark reddish-brown with a fuscous mark on the discocellulars and a nearly straight transverse line behind middle from costa near apex to hind-margin near anal angle; hind-wing above ochreous-yellow tinged with brown at inner margin, behind middle with a faintly curved brownish transverse line; cilia brownish.

Expanse 45 mm.

From Crowley bequest. Without locality.

♀ (?). A female in poor condition entirely pale yellow without markings except a series of small black spots on each side of the abdomen, belongs to the same genus and perhaps also to the same species.

Expanse 48 mm.

Sierra Leone. Crowley bequest.

Family NOTODONTIDÆ.

8. *Epanaphe clarilla*, n. sp. (Plate XXXIII, fig. 10.)

Very nearly allied to *E. clara*, Holl., only differing by the cilia of both wings being pure white and the fore-wing below being white with only the costa very narrowly and a band from costa to vein 5 blackish.

Expanse 47 mm.

Mashonaland (*H. B. Doblie*).
Perhaps only a local race of *E. clara*, Holl.

Family CHRYSOPOLOMIDÆ.

9. *Chrysopoloma crawshayi*, n. sp. (Plate XXXIII, fig. 8.)

♂. Head and thorax above umber-brown; body beneath and legs isabelline-grey, legs indistinctly spotted with black; antennæ deep black; fore-wing above umber-brown irregularly and rather thickly spotted with fuscous, a small silvery spot surrounded with fuscous at end of cell; hind-wing above dull ochreous-yellow without markings; wings beneath isabelline-grey rather sparsely spotted with fuscous; cilia broad brownish tinged with fuscous at anal angle of hind-wing.

Expanse 32 mm.

Brit. E. Africa, Ngongo, 6,450 ft., August (*R. C. Crawshay*).

Nearly allied to *Chr. noria*, Dist., and *flavieeps*, Auriv., but differing from both by the small elongate not rounded silvery discal spot of fore-wing.

Explanation of Plate XXXIII.

Fig. 1. *Phiala simplex.*
2. ,, *marshalli.*
3. ,, *fuscodorsata.*
4. ,, *abyssinica.*
5. *Camerunia flava*, ♂.
6. ,, ,, ♀.
7. *Stibolepis hologramma.*
8. *Chrysopoloma crawshayi.*
9. *Viana crowleyi.*
10. *Epanaphe clarilla.*

XXVI. *Some breeding experiments on* Catopsilia pyranthe *and notes on the migration of Butterflies in Ceylon*, by Major Neville Manders, R.A.M.C., F.Z.S., F.E.S.

[Read May 4th, 1904.]

Plates XXXIV and XXXV.

The following experiments were preliminary to a more thorough investigation.

I had hoped to have ascertained with exactitude the amount of heat, cold and moisture necessary to produce the various forms in which this insect occurs. The experiments were merely preliminary in order to ascertain the difficulties and the apparatus required to carry out a thorough investigation. They may be of interest because, as far as I know, they are the first experiments made with icing the pupæ of a tropical butterfly. Even these preliminary experiments are far from being complete, as I was ordered home when in the middle of them and had to hand over my notes and material to another entomologist, Mr. Oswin Wickwar, who did what he could in the intervals of a busy official life.

Catopsilia pyranthe occurs in Ceylon under many different forms, three of which besides *Pyranthe* have received names, namely, *Ilea*, *Chryseis* and *Gnoma*. *Gnoma* is usually called the dry-season form and *Chryseis* the wet, and though *Gnoma* is certainly more common in the dry, it is by no means confined to the dry months, neither is *Chryseis* confined to the wet. It may be said that all the forms occur indiscriminately all the year round, and my first object was to ascertain which was the dry form and which the wet, and what would be the several effects of heat, moisture, etc. on the larvæ and pupæ. The first thing was to ascertain the proportion of each variety, and this I left in Mr. Wickwar's hands, and in the month of February 1903, during a migratory flight, he captured sixty specimens, the weather at the time being very dry and hot.

He mentions (and I will allude to this later) that 75 per cent. were males, and 64 per cent. of the total were

marked like Nos. 4, 11 in Plate XXXIV, i. e. *Gnoma*; the striæ in most, however, not being quite so pronounced as in No. 4.

Only four (all females) bore at all heavy markings as in No. 7 (this I should call *C. gnoma*), and in these the coloration of the striæ was of a light yellowish shade, which shade, he says, appears to prevail in the majority of dry-weather females. These sixty insects would appear to be all *C. gnoma*. I have written to ask him to capture this year several hundreds if possible, as I think the numbers too few for a correct estimate.

A large number of larvæ were kept in a glass jar and the atmosphere was kept saturated with moisture, the temperature being about 80° F.; this was also the temperature of the outside air at the time. A considerable number of the pupæ promptly rotted, and the amount of moisture was necessarily reduced. The left-hand series in the photograph shows the result; they all emerged between the 5th and 12th of December and are mostly females. In future experiments I should employ wet and dry bulb thermometers. These five were the only ones that survived.

A considerable number of pupæ, the larvæ of which were reared under normal conditions, were kept at a temperature between 55° F. and 65° F. by means of ice; the result is shown in the second row of the photograph. All emerged between the 9th and 17th of December. The mean temperature of Colombo is 75° F. and the lowest ever recorded is 68° F., the pupæ were therefore 10° to 20° below normal. It was distinctly difficult to keep the pupæ down even to this temperature, but in future, now that there is a cold storage depôt in Colombo, I would try and make use of it for experimental purposes.

The attempt to keep pupæ in an abnormally hot dry atmosphere failed—the pupæ all dried up.

Finally, certain unfortunate larvæ were in an anhydrous atmosphere, a large glass jar with coral unslaked lime. It was exceedingly difficult to keep them alive, as they, the food-plant, and even the eggs shrivelled up. However, by reducing the amount of lime five specimens survived and are shown in column 3; they hatched between 11th and 13th December.

A wet and dry bulb thermometer would be usefully employed in this experiment also.

The results of these experiments are very meagre, only about fifteen to twenty specimens coming to maturity out of quite 200 larvæ. It shows that the constitution of the larvæ is somewhat delicate.*

I mentioned above that Mr. Wickwar had found that 75 per cent. of the insects captured during the dry February flight were males, and quite independently we had observed that the wet-season flight in November and December were almost all females. I cannot account for this further than to say that possibly during the dry months, owing to a more scanty and drier foliage, the female larvæ, if I may use the expression, succumbed; whereas with the damper and more luscious foliage of the wet months they had no difficulty in surviving. The mystery of these migrations may be explained to some extent by this preponderance of the sexes during the different flights.

By a coincidence a migratory flight of butterflies was in full swing on the day I landed in Ceylon, October 25, 1895, and I certainly thought that I had stepped into a land of butterflies. The harbour, streets, and large promenade, the Galle Face by the sea-shore, was alive with butterflies, and being mostly composed of *Catopsilias*, looked for all the world like a snow-storm. In order to gain some idea of their numbers, I selected two points, one at the edge of the sea and the other twenty yards from it, and then counted them as they flew past. The result of my calculation and that of my companion taken separately gave fourteen thousand insects between 10 a.m. and 2 p.m. The flight usually lasts about a week; we have therefore ninety-eight thousand butterflies passing through a space sixty feet broad in twenty-eight hours. In round numbers 100,000.

The sketch map of Ceylon (Plate XXXV) gives the course of these migrations which I have personally observed during the time I was in the island.

There is a distinct difference in procedure between a migratory swarm of butterflies and a swarm of locusts. I mean that the latter advance like a human army so many miles a day from one point to another, and the

* The larvæ were collected in my garden in Colombo, *i. e.* at sea-level; and all, or the very great majority, in the same week; and all from the same food-plants. A considerable number of the eggs were laid by the same female. I used to follow her when she was ovipositing, and snipped off the leaf on which the egg was laid.

country immediately in front of them is clear of them for the time being; whereas in the former, the butterflies in whatever part of the island they happen to be hatched immediately begin to migrate, so that on the same day the migration is as vigorous in one part of the island as in another. As the butterflies hatch in Colombo they immediately fly north, and their places are promptly filled by the insects coming up from Galle, the Galle ones by those from Hambantotte and so on round to Trincomalee, beyond which in the uninhabited country to the north I have been unable to trace them. The proof that the insects on the Trincomalee side really do follow the coast-line and come to Colombo is shown by the fact that it is only during the flights that certain butterflies otherwise confined to that portion of the island, *Papilio Jason* for instance, occur at Colombo, and are there seen migrating in the same frantic haste as their companions.

On one occasion, on December 2, *i. e.* in the wet season, I was observing the flight from Fort Frederick, Trincomalee. The butterflies came from the northern shore straight across the sea to the end of the peninsula on which Fort Frederick is built; several bushes of the food-plant of *C. pyranthe* were growing there, and these were literally covered with eggs, as many as half-a-dozen on a single leaf; the bushes were so speckled with the multitude of eggs that they looked as if handfuls of sago had been scattered over them. The flights in November and December on both sides of the island undoubtedly comprise a majority of females, but scarcely a single larva out of this multitude of eggs could possibly have come to maturity; there was not enough food for half of them, and on a previous migration the bushes not far off were completely stripped by the larvæ.

The insects composing the coast flight are almost entirely *Catopsilias*, two species of *Appias*, *Euplœa ascla*, and *E. montana*, in the hill districts, and *Danais septentrionis* irregularly. I should have mentioned that the process of laying eggs was totally contrary to what one usually observes—there was no attempt to choose a suitable leaf, no deliberation displayed about the operation at all, but every female seemed possessed with the one insane idea of getting rid of her eggs with the utmost expedition, utterly regardless of the fate of the future larvæ, and then madly continuing her flight. When in full migration

they fly with great rapidity, and can give points to *Colias edusa*. They select the sea-coast, I feel sure, simply to avoid obstacles. The road between Trincomalee and Kandy, which runs through dense forest, is also largely used by the migrating insects. When travelling south they have the N.E. monsoon behind them, but when turning north they meet a stiff wind which really seems to drive them to a faster flight. The breadth of the flight is usually not more than a quarter of a mile.

The cross-barred line on the map shows one of the lines of migration of the two species of *Appias*, *Paulina* and *Albina*. They both breed in the low country, as shown by the square dots, and fly in a broad belt of insects about a quarter of a mile wide across the open downs at D'lawa, 4,000 feet, and up to the Horton Plains, 7,000 feet, when they turn north toward N'Eliya, 6,000 feet, cross the plateau towards Rambodde Pass at its northern end, and then make their way again to the low country somwhere near Kandy. Part of the flight edges away across the D'lawa Downs northwards and reaches the N'Eliya plateau through the Hakgala Pass.

The migration of *Euploea montana* starts somewhere in the neighbourhood of the Hortons, and follows much the same course, so far as I know, as *Appias*.

The uninterrupted line is a curious and interesting one; it is that of *Kallima philarchus*, which annually migrates, sometimes in large numbers, though it is usually considered a rare insect. So far as I can at present ascertain there is only one migration annually in November or early in December. The insects come up from the low country to Haldumulle, then up the passes leading to the Hortons, and then across the plains to some uncertain locality, but where I have no idea. The insect does not occur in the Colombo or immediate Kandy districts nor about N'Eliya.

It is extremely difficult to obtain assistance in carrying out an investigation such as this requires. Entomologists are few in number, and, with the exception of Trincomalee and one or two other places, Europeans are confined to Colombo and the Hill district. The remainder of the island is mostly covered with jungle, is thinly inhabited with only here and there a few overworked Government officials and ignorant natives.

The reason for these flights is at present very obscure; it was probably originally a question of food-supply. This

instinct might have arisen from the necessity for constantly seeking new feeding-grounds for the larvæ. As the species increased this tendency to expand would not only preserve the species, but would cause in time its very material increase; the necessity for constantly enlarging the feeding-grounds would in time produce an inherited tendency to migrate. But in due course, when all available feeding-grounds were occupied, as they soon would be in a small island like Ceylon, some check would be required to keep the enormous number of resulting butterflies within due bounds, otherwise the species would be in danger of annihilation from their very numbers. This appears to me to be effected in the following manner: the insects of the wet-season migration are mostly composed of females, and provided that the males can successfully impregnate more than one female, the result would be an enormous number of eggs laid, and this I have shown to be the case. The migratory instinct is so strong that the females are precluded from taking any precautions for their future offspring, as the females of most butterflies do; and the result is that the struggle for existence among the multitude of larvæ subsisting on the food-plant, which is quickly diminishing by their voracity, and also slowly by the heat and dry weather, is so great that the larvæ which would produce female butterflies succumb, and a great majority of males are produced which form the dry-weather flights. This majority of males would also be another factor in checking the increase of the species. During the intervening portion of the year the species would gradually increase, until the wet months at the fall of the year favour a luxuriant vegetation, and all the female larvæ then survive, and possibly being stronger, crowd out the male larvæ. These larvæ produce the overwhelming proportion of females in the next wet-season flight, with the result shown above. This migratory instinct, originally due to a necessity for the increase of the species, is now become a means of preventing its undue propagation.

Explanation of Plate XXXIV.

Under-sides of bred specimens of *Catopsilia pyranthe*, Linn.

Nos. 4, 5, 8 are males; the rest females.

The first vertical row (Nos. 2, 1, 7, 6) were kept as larvæ in an atmosphere saturated with moisture.

The second vertical row (Nos. 17, 15, 16, 3, 4) were kept under normal conditions as larvæ, and iced as pupæ.

The third vertical row (Nos. 14, 9, 5, 11, 8) were kept as larvæ in an atmosphere rendered anhydrous by unslaked lime.

In each row the most heavily marked specimens are placed first; the least heavily marked are placed last.

The first two rows tend to be of the form usually called *gnoma*; the last row consists of the form *pyranthe*.

Explanation of Plate XXXV.

Sketch Map of Ceylon, showing the migratory flight of various species of Butterflies.

An explanation of the lines employed is given on the Map.

XXVII. *Sound-production in the Lamellicorn Beetles.*

By Gilbert John Arrow, F.E.S.

[Read October 5th, 1904.]

Plate XXXVI.

A summary of our knowledge of the vocal organs of beetles was published by Mr. C. J. Gahan in the Trans. Ent. Soc. Lond. for 1900, and many new observations of the greatest interest recorded. In this memoir ten genera of the great Lamellicorn group were described as possessing vocal powers in the adult stage, and in addition to these certain other beetles of the family Dynastidæ not enumerated by Mr. Gahan were known to stridulate. Since 1900, however, various fresh and interesting observations on the subject have appeared in foreign publications, and my own study of these beetles has brought to light vocal structures as yet undescribed and revealing the existence of the faculty in new groups. The variety of the structures serving the purpose in the Lamellicornia and the remarkable fact of the occurrence, so far unknown in any other beetles, of highly-developed stridulating organs in the larvæ, render these the most remarkable in regard to vocal powers of all insects, and, although our knowledge of the organs is no doubt still very incomplete, the additions made to it in the last few years are, I think, quite sufficient to justify the present attempt to set forth all that is at present known on the subject.

As to the stridulation of larval Lamellicornia, little more has been discovered since the remarkable work of Schiödte was published in 1874 (Naturhistorisk Tidsskrift, Ser. 3, vol. ix), but many additional genera are here enumerated as stridulators in the perfect state, and, although the faculty seems much less general in that stage, the list will no doubt yet be considerably increased.

The special importance of stridulation in the Lamellicorns is probably in part due to a mental development higher than that of most other beetles and evidenced, not only by the concentration which here occurs in the nervous

system, but in certain cases by a degree of social organization which was until quite recently hardly suspected, although the elaborate instincts of certain members of the group attracted attention in very early times and procured from the ancient Egyptians peculiar honours for the Sacred Scarabæus and other beetles of the same family.

The usual type of stridulating organ in the Lamellicornia is the same as that now known to occur in nearly all the large groups of Coleoptera and consisting of a highly-chitinized plate, the surface of which is broken up into a number of extremely fine parallel ridges capable of being set in vibration by being scraped by one or more sharp edges situated upon another part of the body. Practically all the musical organs described by Mr. Gahan, although varying to an extraordinary extent in their situation in different beetles, are of this pattern; but structures of somewhat greater variety have come to light in Lamellicorns, so that it is necessary to modify to some extent our ideas of the elements necessary for sound-production in Coleoptera. In a wide sense, however, all the instruments coming within the scope of the present paper are of the "stringed" type and consist essentially of two parts, of which I shall call the more delicate and regular one by whose vibrations the sound is immediately produced, the "stridulatory plate" or "stridulatory area," and the less complex one which excites these vibrations, the "plectrum." In other groups of beetles instruments of percussion occur, and in one Lamellicorn, the common Cockchafer, one author * has described a vocal apparatus of the "reed" type, but I have not been able to find any confirmation of this discovery.

The stridulatory area and plectrum do not generally need any very fine adjustment for the performance of their function, but in order to secure contact one of them commonly covers much more space than the other. When the stridulatory area is narrow or confined to small tubercular elevations the plectrum usually extends considerably beyond it, and, on the other hand, if a broad area is found covered with the vibratory ridges the plectrum will probably be more or less minute. The musical quality of the vibrations produced by these structures depends upon their extreme hardness and rigidity, and these are commonly indicated by a black or

* Landois, Thierstimmen, p. 110.

peep-red colour produced by the dense deposit of chitin. This characteristic coloration frequently reveals to the eye the presence of organs so delicately proportioned as to require a high power of the microscope to reveal their form. In soft-bodied and pale-coloured larvæ in particular their presence may generally be detected in this way.

The only other requisites in these instruments are that the ridges or spines should have space in which to vibrate without hindrance and should be protected from the risk of injury. An entirely external situation exposes such a delicate structure to wear and tear and clogging by dirt, and is only occasionally found. The sound-emitting surface more commonly occupies a position where it is covered when not in use but is extruded by the act of using it.

Stridulation is apparently general in the larvæ of most of the groups of Lamellicorns, although those of a few of these groups are still unknown. Vocal structures have been described by Schiödte in the earlier stage of many genera dumb in their adult condition, but the only one examined by him in which such organs were not found is the genus *Trox*, the imago of which has long been known to squeak loudly. It is remarkable that whenever the organs are present in both stages, those of the perfect insect are not developed from their larval representatives but invariably occur in an entirely different situation. In the larvæ of most of the families the stridulatory area occupies a roughened surface on the lower face of each mandible, so situated as to be capable of being scraped by a series of strong teeth upon the contiguous upper side of the maxilla. In *Scarabæus* the mandibular part of the apparatus is a large space at the base of the jaw thickly covered with minute tubercles, and a row of strong curved hooks is found on the basal part of the maxilla. In the fully-developed beetles no vocal apparatus has been found, although it was long ago reported by a French traveller, quoted by Darwin in "The Descent of Man" (Chap. X), that the male of *Scarabæus* (*Ateuchus*) *cicatricosus* stridulates to encourage the female in the work of making and rolling the ball of food material, and from distress if she is taken away. I have made a careful dissection of the beetle to find the means by which this is done, but have entirely failed to find any structure adapted for producing sound, and, in the absence of any confirmation of a statement

concerning an insect which has for ages attracted attention, I cannot help thinking that this witness must have made a rather too free use of his imagination. No one probably has made more study of these insects in their natural environment than the French naturalist Fabre, but, from his very detailed account of it, it is evident that he never heard it utter any sound. More than this, he took special pains to ascertain whether there was any co-operation between male and female and pronounced decidedly against it, having found that when two beetles seemed to be working in conjunction they were as often as not of the same sex.* Professor Flinders Petrie and others who have frequently watched and handled them inform me that they have never heard any sound from these beetles.

It has been questioned whether the tuberculated area on the mandible of the larva in this and other groups of Lamellicorns is really a sound-producing organ, but this point seems to be set at rest by actual observation in other larvæ in which an exactly analogous structure occurs. A finely-tuberculated area at the base of the mandible, with corresponding teeth upon the maxilla, have been described by Schiödte in larvæ representing the families Copridæ, Aphodiidæ and Melolonthidæ, but in three other families (Rutelidæ, Dynastidæ and Cetoniidæ) a similar but rather more elaborated form of the same arrangement appears. Dr. Ohaus, who has recently made many extremely interesting observations upon the habits of Brazilian Lamellicornia, has described the stridulation of the larval *Macraspis cincta*, one of the Rutelidæ.† I have examined the apparatus of an allied species, *M. tristis*, from Dominica, and it also occurs in the other genera of which the larvæ have been examined (*Pelidnota*, *Parastasia*, etc.), and very likely throughout the family. In these larvæ each mandible bears an oval, rather concave, area, little larger than a pin's head, upon which the tubercles found in the same situation in the Melolonthidæ are replaced by transverse ridges so fine that fifty or more are compressed into this small space. Upon the basal part of the maxilla, where it comes into contact with this instrument, is placed a row of sharp but stout, only slightly-elevated teeth. By scraping these upon the

* Fabre : Souvenirs Entomologiques, 1879, p. 10.

† Stett. Ent. Zeits., 1899, p. 237.

mandible a high-pitched note is produced which is only audible to the human ear at a short distance from it. Dr. Ohaus found that when held in the fingers a gentle squeeze caused his larvæ to squeak, but he also found that if a strange larva were introduced into a piece of wood in which others were tunnelling, these would utter a warning cry and the intruder would shortly make his exit again, whereas in an unoccupied log he would readily establish himself. When confined together they showed no compunction in killing and eating each other, so that it is evidently a part of their moral code that each should be left in undisturbed isolation, and if, as is likely, their note is conducted undiminished through the wood in which they live, this may supply us with the principal object of the faculty. It is at least probable that when, in the course of tunnelling through the same stump, two burrows approach one another, the warning sound informs the inmates of the position of affairs in time to change their direction. All their operations are, of course, conducted in darkness, so that sight is of no avail to them. The great Danish authority on beetle larvæ states that these, in common with Lamellicorn larvæ in general, are without eyes, the genus *Trox* being the only exception known to him; but I have found a pair of small ocelli, situated just behind the antennæ, in *Macraspis* and other genera of both Rutelidæ and Dynastidæ.

Dr. Ohaus has been the discoverer of the vocal apparatus in the mature form of the same genus. The beetle draws its hind-legs across its sides as if playing the fiddle, as indeed it does, but the leg represents, not the bow, but the instrument itself, while the abdomen bears the means by which the vibration is set up. If a hind-leg is removed from a dead specimen and the inner face of the femur examined under a lens, it is seen that near the knee and running parallel to the upper edge there is an elevated ridge with a surface like that of a file, owing to a large number of exceedingly fine transverse ridges. Upon that part of the side of the abdomen over which the femur is adapted to move may be found a series of conspicuous ridges which look as if the surface when in a soft condition had been deeply scratched in an oblique direction, leaving the upper edge of each cut protruding. These edges form the plectra. Dr. Ohaus states that the beetle sometimes uses this instrument by rubbing the legs across

the abdomen and sometimes by working the abdomen against the legs while these are held at rest.

This instrument is not at all of a widespread type, being confined to about fifty species at present known, all of which inhabit Tropical America, while no trace of it is found in others very closely related to them. In a few species belonging to the neighbouring genus *Lagochile* the same organ appears in a slightly modified form, the file upon the hind-leg being less narrow and not rising abruptly from the surface of the femur, while the ridges upon the sides of the body are confined to definite patches upon two or three of the segments. In a third genus, *Geniates*, of this group, less closely related, yet another variant has been discovered by my friend.* The microscopic ridges here form a compact mass placed entirely upon the knees, either of all four posterior legs or of the third pair only (Pl. XXXVI, fig. 11). *Geniates* is an insect of quite a different build to *Macraspis* and *Lagochile*, with more slender legs and a less hard and shelly exterior. The knees do not lie close to the sides and no ridges are found in that situation. The posterior femora, unlike those of the genera just mentioned, extend beyond the lateral edges of the elytra, which form on each side a flange flattened above and much thickened below. Crossing the outer half of this thickened part at right angles are numerous strong, sharp-edged ridges, well adapted for setting up vibrations in the instrument occupying the corresponding position upon the leg when this is drawn across the elytron. Above each of these ridges is a very stout spine, the growth of which seems to have produced the elevation which has become modified for this special purpose.

These three genera of Rutelidæ are all inhabitants of the same part of the world, viz. Tropical America, and no other members of the family are as yet known to produce similar sounds. They are of great interest as showing the apparently erratic occurrence of sound organs of the same essential type (a type peculiar to this family among the Lamellicorns) in small groups of a family, not immediately related one with another but living in the same environment. The natural inference is that the organ has in former times been common to at least a large part of the Rutelidæ, but owing to some local causes has only been retained in these isolated cases.

* Ohaus, Berl. Ent. Zeits., 1903, p. 237.

In the Cetoniidæ, whose larvæ possess a well-developed vocal apparatus almost identical with that of the Rutelidæ, the adults of a single genus only are known to stridulate, the genus *Ischiopsopha*, which is peculiar to Australia, New Guinea and adjacent islands. These are solidly-built beetles with hard exteriors and stout legs, and their method of stridulation seems at first sight exactly the same as that of *Macraspis*, but the parts of the instrument are really reversed. The vibratile ridges are here placed upon the sides of two or three of the abdominal segments, where they form slightly-elevated triangular or crescent-shaped areas. The hind femora are flattened and so articulated as to slide over these ridged surfaces, and upon the inside of each femur is found a series of oblique ridges traversing its whole breadth. The number of species in which this form of organ occurs is small, and, as seems not uncommon among beetles, form an isolated musical community in a host of related forms, the rest of which are without this faculty.

Another of these isolated groups of species is the single known stridulating genus in the enormous assemblage of species comprehensively known as Melolonthidæ, and forming the bulk of the entire Lamellicorn series. As already mentioned, the larvæ of the Melolonthidæ, at least of those common European genera which have been examined, possess a structure in the mouth very similar to that of the larval *Scarabæus*. One of the common genera of which the instrument was described by Schiödte is *Serica*, and in this the adult beetle has a stridulating organ borne in a situation which seems to be entirely peculiar to it. The stridulatory plate is formed by the prosternum which is produced into a kind of thin lip, the inner side of which is exceedingly delicately ridged. This plate is scraped by the edge of the mesosternum which the movement of the thorax slides up and down within the prosternum.

In no other genus of Melolonthidæ has any true stridulating organ been found in the perfect state, although it is said that *Melolontha* and *Polyphylla* can utter audible sounds, and Landois in his "Thierstimmen" (p. 109) has accounted for these to his satisfaction, considering *Melolontha* to possess a set of "reeds" in its spiracles and *Polyphylla* to employ the costal vein of the wing as a musical instrument. In the former case the vibratile

appendages as described by Landois appear to form part of the respiratory system and cannot be supposed to be under the separate control of the insect, so that any sound of which they may be the cause is merely incidental to the function of respiration. Even if Landois is correct, therefore, these structures are not really analogous to those which form the subject of this paper. As to *Polyphylla*, the beaded appearance of the costal vein is in no way peculiar. It is very commonly found in the wings of Coleoptera, but the rolls are smooth and rounded and seem by no means adapted for producing rapid vibrations.

The larval instruments of the Dynastidæ are practically the same as those of the Rutelidæ, but in the former family a number of genera have long been known to have the same faculty in the adult stage. Here again the instruments are found in a situation characteristic of the family. The file is borne on the upper-side of the last segment but one of the abdomen and is scraped by the posterior edges of the elytra. The terminal segment is generally uncovered and more or less clothed with hair, but the preceding one is almost covered by the wing-cases in its normal position, and this, in the musical forms, is bare and transversely striated either across the greater part of its breadth or in narrow longitudinal bands.

In the Rhinoceros Beetle (*Oryctes*) of Southern Europe and allied forms inhabiting the tropics, such as *Strategus*, *Enema*, *Trichogomphus*, etc., the sculptured surface is very large, and by the movement of the abdomen can be drawn across a small bent-in piece of the hind margin of each elytron. It was noticed by Darwin that the ridges of this stridulatory plate are finer and more numerous in the female *Oryctes* than in the male, and this to him suggested a difference of function in the two sexes, or perhaps the absence of any function in one. It does not seem to me to be capable of this interpretation. When, as is not uncommon, there is a difference between the two sexes in the fineness of the vibratory ridges, it appears to be the rule that those of the male are coarser than those of the female. If there were a real analogy with the voice of vertebrate animals and of the grasshoppers and loud-voiced insects, *i.e.* if, as Darwin supposed, voice were here as elsewhere primarily a male characteristic, we might expect to find the vocal apparatus of the female beetle altogether feebler in its development than that of the

male, instead of the reverse. I believe the difference described to be directly connected with the more rapid movements of the muscular and less corpulent male, the musical result of the less rapid scraping of a more closely-ridged plate being the same as that produced by more vigorous movements upon one correspondingly coarser.

In the numerous forms of Dynastidæ, inhabiting all parts of the world, in which these structures are found, there are considerable differences in the manner and degree of development. In those in which the file is the finest and most regular the segment bearing it is enlarged at the expense of those adjoining. It may be produced forwards under the elytra, or backwards, encroaching upon the last segment (pygidium), which is immovably united with it. In two of the genera, of which the sound, judging from the great development and regularity of the ridges, seems to be the loudest and most musical, viz. the American *Scaptophilus* and the Oriental *Camelonotus*, the extremely hard stridulatory plate is produced backwards in a broad lobe, until in some species the pygidium is almost crowded out of existence. The greatest degree of sexual disparity in the organ which I have noticed in Coleoptera is due to the much greater extension of this plate in the males of the latter genus. When the propygidium has a file upon each side corresponding to the two elytra a slight prolongation is frequently visible behind each file.

Although in *Camelonotus* the stridulatory plate is one of the best-developed to be found among insects, and from its extreme sharpness and regularity undoubtedly produces a high-pitched musical note, the corresponding structures in many of the related genera are much less fine and regular than is usual and must generate sounds of a very different kind, probably in some cases a harsh, grating sound. This may partly account for the fact that scarcely any observations seem to have been made as to the vocal powers of any of these insects, some of which are of large size and very abundant. An unmusical sound naturally attracts little notice, but it would be remarkable that the notes produced by apparatus so perfect as that of *Scaptophilus* and *Camelonotus* and other genera have not aroused attention, but that the extreme paucity of biological observations recorded, notwithstanding the multitude of collectors, is only too familiar.

In the island of St. Helena is found a peculiar genus of Dynastidæ named *Mellissius*. This consists of two species, of which one, *Mellissius adumbratus*, has the propygidium produced backwards and covered with very fine and well-developed transverse ridges, while in the other, *Mellissius eudoxus*, the same part is reduced in size and its surface is relieved only by coarse scattered elevations which by their transversely elongated form show their derivation from the very different microscopic ridges still perfectly preserved in the other form. This degenerate species is much more common and widespread than the other, and we may suppose that, within the restricted area of the island, stridulation, owing to some unknown conditions prevailing there, is rendered useless or disadvantageous, and that, a race in which the stridulatory apparatus is atrophied having arisen, the older form is gradually disappearing before it. It was observed by their first describer, Wollaston, that *M. eudoxus* produced no audible sound, but he seems to have had no opportunity of handling living specimens of the rarer form.

Other genera possessing an apparatus of the Oryctes type are *Xyloryctes*, *Scapanes*, *Stypotrupes*, *Cyphonistes*, *Dichodontus*, *Heterogomphus*, *Podischnus*, *Thronistes*, *Corynoscelis*, *Augosoma*, *Lonchotus* and *Dipelicus*.

In the large genus *Heteronychus* different species show an interesting transition from simple forms in which punctures originally existing upon the propygidium have become drawn out laterally into furrows, covering a large part of the surface and leaving fine but not very regular ridges between them, to more numerous species in which the ridges are perfectly regular, much more delicate and restricted to a narrow longitudinal band on each side, the two bands always converging and becoming more coarsely ribbed as they approach the anterior border of the segment. From this elaborated type the structure may be traced through progressively coarser forms until at last we find the component ridges large and separated by intervals several times their own diameter, so that any sound produced from them must be more a rattle than a squeak. In species of the allied genus *Pentodon* the ridges become still more scattered and irregular, and a similar degenerate condition seems characteristic of *Cœlosis*. Only practical observations can prove whether these scattered ridges are merely the vestiges of an organ which

was formerly functional, or whether, although degenerate, they are still capable of producing sounds of some kind at the will of the insect.

Double files of almost identical form occur in *Heterorychus*, *Podalgus*, *Crator*, *Callistemonus*, *Pentodontoschema*, *Pimelopus* and *Xenodorus*. The last is of special interest from the fact, very rare in Coleoptera, and not before noticed in the present instance, that one sex only has the vocal faculty. The genus is a rather isolated one, consisting of a single West African species not closely related to any other known form. In the males the short ridges composing the files are very numerous, sharp and strongly elevated, but the propygidium of the female shows only a few coarse scattered elevations, of which two loose clusters vaguely represent the well-developed apparatus of the other sex. The explanation of this striking inequality of the sexes is not difficult. In the male the last dorsal segment is turned inwards so as to become almost completely ventral, as in the males of many other Lamellicorns. In the female this part of the body occupies the normal position, and the consequence is that the preceding segment occupies a more anterior situation than in the male. As there is no corresponding difference in the elytra, the extremities of these, which scrape the files of the male, do not coincide with the propygidium of the female. It seems probable that a simultaneous change of form has taken place in both sexes and that this has resulted in the stridulating apparatus in the female becoming useless and therefore degenerate.

There is a genus of Brazilian Dynastidæ (*Acerus*) which Lacordaire, in his "Genera des Coléoptères" (vol. iii, p. 415), has expressly stated to be without stridulating organs. This, however, I have found to be a second case like that just mentioned, and Lacordaire's statement is no doubt based upon the examination of a female, in which sex the propygidium is simply covered with not very fine granules. The insects are rare, but from the examination of a single male specimen in the British Museum I have found that in this sex there is a well-developed file covering the entire median part of the segment, as in *Oryctes*, etc. It is a remarkable fact that, with the exception of a single species (the Hispid, *Spilispa imperialis*, in which the organ is a highly peculiar one), the only beetles hitherto known to have stridulating organs in the male

sex alone, although belonging to an altogether different tribe, the Heteromera, also produce the sound by the same means, viz. friction between the elytra and the terminal part of the abdomen. In many weevils in which Mr. Gahan found curious differences of structure between the sexes the apparatus is also found in the same situation. It has been supposed that such sexual differences pointed to the development of the vocal faculty in the males by the operation of female preference, but I think this striking coincidence of situation in all the known cases, although occurring in quite unrelated groups of beetles, clearly indicates that the explanation is the simpler one of the different functions in male and female respectively of the region of the body upon which the organs are here found.

In another peculiar Dynastid genus, *Golofa*, the propygidial files have a form slightly different from that occurring elsewhere. The segment bearing them, like the rest of the body, is covered with thick hair, and the files are the only denuded portions and are therefore very conspicuous. They are alike in both sexes, but are not, as in other genera, straight and diverging, but each has an outward curvature, thus ( ). In *Pseudosyrichthus clathratus*, hairs also surround the files, which are straight in that insect. In *Megaceras*, which is nearly related to *Oryctes*, the two files are united near the anterior margin of the propygidium and diverge strongly towards the other end.

A quite different apparatus appears in *Ligyrus*, a genus otherwise closely related to *Heteronychus*. Here, a finely-sculptured area is found inside each elytron near its extremity and at the outer edge. The pattern of this is very peculiar, the ridges being seen under the microscope to be blunt-edged and connected by cross-veins so as to form a kind of honeycombed structure. The margin of one of the dorsal segments is sharply upturned on each side beneath these elytral surfaces. Although not suited for producing a musical note, this is probably a true sound-producing organ. Some of the species of *Ligyrus*, which are inhabitants of Tropical America, are very abundant, and it should be easy to test their vocal power. The occurrence of peculiar adaptations such as this, confined to very small groups or even single species, is one of the most curious phenomena encountered in connection with stridulating organs.

One of the few Dynastid genera whose voice has actually been heard and recorded is *Phileurus*, several South-American species of which are stated by Lacordaire* to produce a noise by rubbing the abdomen against the elytra. Curiously enough, the instruments used have not yet been satisfactorily determined, although according to Lacordaire there is a longitudinal band inside the elytra near the outer margin. Other investigators have failed to confirm this, and in spite of a careful search I have been unable to find any specially-developed ridges either on the elytra or in any other part of the body. I have been driven to conclude that the sound is produced by the friction of the two dorsal segments preceding the propygidium against a horny plate in the wing. This plate bisects the angle forming the apex of the folded wing, and on its lower side is studded with short, strong and erect spines. The greater part of the upper surface of the two segments mentioned is also covered with very minute spinose processes, but these become much more crowded and form a microscopic rasp which corresponds in position to the extremity of the wing, so that the movement described by Lacordaire would no doubt produce a shrill scraping or hissing noise. This structure is quite different from any so far described in this paper, but, as will presently be seen, living beetles belonging to other families of Lamellicorns have recently been proved to produce sounds by means almost identical but much more specialized and clearly defined.

The larvæ of the beetles belonging to the family Aphodiidæ possess an apparatus in the mouth closely resembling that of the Sacred Beetles and their allies, but no vocal powers have been recorded in any adult insect of this family, the members of which, although small, are extremely common everywhere: nor do they seem to exist in the allied group of the Hybosoridæ, of which the immature forms are as yet entirely unknown. Of the Copridæ themselves (to which group the Sacred Beetles belong), only a very few of the mature insects are known as stridulators. I have shown that *Scarabæus* has been wrongly included amongst these, but many observers have testified to the squeak emitted by species of *Copris*, one of which inhabits our own country. There has been some contradiction, however, as to the means by which it is done in this genus.

* Annales des Sciences Naturelles, vol. xx, p. 267.

In *Copris* there is a provision, found in many other beetles, to secure rigidity in the closed elytra. The two edges which meet down the middle line of the back are each provided with a groove, formed by a fold the lower edge of which is more prominent than the upper one. The two edges interlock so that the elytra can be held firmly together. Near the junction each elytron has on its inside a projecting rib, and there is a deep groove along the middle of the propygidium which fits over the two ribs and so secures still further rigidity. Just in front of this groove, upon the preceding segment, are a few short transverse ridges, and the ribs just described are also cut into transverse ridges, but the latter are exceedingly fine and numerous. Different writers have described one or other of these series of ridges as the source of the sound, but it does not seem to have been realized that both are essential parts of the apparatus, the longitudinal movements of the abdomen causing the delicate chords composing the elytral ribs to be plucked by the corresponding ridges of the back, while the propygidial groove guides these movements and secures the close approximation of all the parts.

This type of apparatus has not been found in any other genus of Copridæ, but it occurs again in almost the same form in the genus *Trox*,* belonging to another family, the *Trogidæ*. Here again, as in *Copris*, the elytra fit tightly together in the resting position, and in certain species which are without wings are inseparably fused at the junction. The finely-ridged bars at the suture are scraped by one or more sharp-edged plectra placed transversely upon the penultimate abdominal segment. It is stated in Darwin's "Descent of Man" that *Trox sabulosus*, a British species and one of the smallest representatives of the genus, squeaks quite loudly when handled. The faculty seems to be general in this large and world-wide genus, but I have found no indication of it in any other Trogidæ.

The method of stridulation in *Heliocopris*, the second genus of Copridæ in which it has been discovered, was described by Mr. Gahan in the paper referred to. The sound is here produced by pressing the abdomen not upwards but downwards. The insects of this genus are amongst the bulkiest of all beetles, but the stridulating plate is minute and occurs near the inner margin of each hind coxa, while the inner half of the inturned part of the

* Sharp, Entom. Mon. Mag., 1897, p. 206.

abdomen against which the coxa revolves is similarly but rather less finely striated. The mobility of both coxa and abdomen no doubt allows the coxal file, in spite of its small size, to play over the large striated surface in the socket. If a hind coxa is removed from a dead specimen of *Heliocopris bucephalus* its inner face will be found to be principally clothed with stiff bristles, but these are absent near the margin. The smooth strip remaining is covered with fine but not deep striations, but a very small portion near the inner end is much more deeply and regularly incised and the surface is waved in such a way as to produce two or three gentle elevations above the general surface. The microscopic ridges crossing these are exceedingly hard and sharp and are of course rubbed with considerable force against the corresponding abdominal ridges, the effect, as can be easily proved in a dead specimen, being a very audible squeak. In *Heliocopris dominus* the general striation of the naked part of the coxa, from which the finished instrument has apparently been evolved, has disappeared, but the small perfected portion is practically the same.

In an allied genus, *Synapsis*, not hitherto recorded as a stridulator, a similarly sculptured socket occurs, and the inner surface of the coxa is finely corrugated but without any more regularly ridged or elevated spot. Here the bristles have not vanished but are reduced at the inner and posterior part to exceedingly short and stout stumps which lie almost flat and all point forwards. These apparently serve to set up the vibrations, the abdominal ridges here forming a comparatively coarse stridulatory plate. The effect of producing friction between these parts in *Synapsis*, as might be expected, is a much harsher and less musical sound than in *Heliocopris*.

There are three highly peculiar and little known beetles inhabiting the western part of South America and forming the genera *Taurocerastes* and *Frickius*. These have been made by M. Germain into a family under the name of Taurocerastidæ, although the points of structure upon which he has relied only point to a relationship with the Orphnidæ, with which they have not hitherto been compared. None of these insects have hitherto been recorded as stridulators, but I have found organs of several distinct types in the two groups. In *Taurocerastes* and *Frickius* (Pl. XXXVI, figs. 5, 5*a*) is a structure similar to that last described, but the striated, or ridged, part of the coxal

cavity is smaller, more sharply defined and more finely sculptured, and the coxa is provided at the corresponding part with a series of plectra consisting of oblique rows of short and strong chitinous crests. The similarity between the vocal apparatus of the *Heliocopris* and *Taurocerastes* forms may indicate a relationship greater than has been supposed to exist between them, each being of a rather primitive type.

In *Orphnus* and the genera directly related to it sound is produced in the same region but by a rather different means. The hind coxæ are expanded in these beetles and overlap the abdomen behind, and near the outer end of the flattened inner side is a rather broad and slightly convex area which is delicately ribbed in the direction transverse to the axis of the body. The hinder margin of the cavity receiving the coxa forms an acute edge for scraping this vibratory plate. In the common Old World genus *Orphnus* the plate is large and rectangular, and the lip of the cavity appears to be supplemented by two other sharp edges placed within it. In *Hybalus*, which represents the family round the shores of the Mediterranean, the plate is very large and occupies nearly the whole outer half of the coxa beneath. In the New World representative, *Ægidium* (Pl. XXXVI, fig. 10), although the beetles are larger and the hind coxæ more dilated, the vocal area is reduced to a much smaller semi-elliptical space. In the new genus to which I have given the name of *Ægidinus* it is elongate, narrowing at both ends. Indeed stridulation is probably general throughout this small family, although it has not hitherto been recorded. Mr. Guy Marshall, however, informs me that he has noticed the sound uttered by species of *Orphnus* inhabiting Mashonaland. Another allied genus, of which, by M. René Oberthür's kindness, I have been able to examine one of the only two known examples, is *Sissantobius*, in which the same apparatus is present, as shown by the characteristic form of the coxæ.

In a very remarkable new genus inhabiting the same region of Patagonia as *Frickius* and to which I have given the name *Idiostoma*, the posterior coxæ are scarcely at all flattened, but very thick, and the striated instrument therefore traverses a convex surface (Pl. XXXVI, figs. 1, 1*a*). It forms a long and narrow rope-like prominence agreeing in its situation with the instruments just described, although the relationship of the two species in

which I have found this organ is not very close either to *Orphnus* and its allies or to any other known beetles. There are parts of three abdominal segments forming the coxal cavity, and at the bottom of the cavity is excavated a pit which extends the greater part of its length. The outermost edge of this is sharply raised, and it appears to be against it that the coxal file rubs, the pit providing the open space in which the chords can freely vibrate. In the other genera just mentioned the expansion of the coxa beyond the lip of its socket brings the vibrating ridges in each outward movement of the coxa outside it; while in *Heliocopris* the production of the microscopic ridges across alternate slight elevations and depressions confines the contact to a point, leaving the great part of each "string," as in a violin, always free.

Among the genera at present placed with the Orphnidæ there still remains a large and very peculiar series of small beetles called *Ochodæus*. These, which are less than a quarter of an inch in their average length, inhabit many parts of the world but are rarely found; and their manner of life, which from their structure is certainly peculiar, seems to be unknown. The hind coxæ are here differently formed to those of the true Orphnidæ and show no trace of any vocal apparatus—indeed all parts of the framework are less hard than in those and other stridulating Lamellicorns, and I should have supposed them to be voiceless had I not found it mentioned by Dr. G. H. Horn (Trans. Amer. Ent. Soc., 1876, p. 180) that the North American species utter a sound. This led me to a more careful investigation and the discovery of a new and remarkable apparatus. The propygidium of these beetles is furnished in the middle with peculiar grooves and spines, differing considerably in the different species but all serving to hold the elytra firmly in position. The latter, like the remainder of the general surface, are more or less hairy outside, but their inner surface is polished and shining except for a kind of roll or thickening extending from the tips along and within the outer margins (Pl. XXXVI, fig. 2*c*). This is doubly striated, producing an "engine-turned" surface; or more probably this effect is due to a diagonal series of modified spines placed in close juxtaposition. The abdomen is little chitinized, and seems too soft to bear any part in stridulation, but when removed, examination with a strong lens reveals on each

side of one of the dorsal segments a curious club-shaped appendage, very small and evidently extremely hard. The lateral parts of the back are formed, as in other Lamellicorns, by the bent-round ventral segments and are comparatively rigid, while the intervening part is delicate and flexible. At the inner limit of this rigid part of the third segment from the apex is the small chitinous prolongation referred to, pointing obliquely inwards and backwards, *i. e.* towards the apices of the elytra (Pl. XXXVI, fig. 2*a*). In most of the species of *Ochodæus* in which I have examined it, this organ has a distinct neck and bulbous part, and under a high power of the microscope the latter is seen to be studded with projections placed in rings around it. By the extension and contraction of the abdomen these would produce friction with the files upon the elytral folds, and, if it appears remarkable that the sound generated by such minute structures should be audible to human ears, it must be remembered that the total area from which the sound is produced is considerable in proportion to the size of the insect, and the really striking thing is that the voice of so small a creature should be audible to us at all.

The form of the dorsal stridulators differs according to the species, but the description just given will apply to the two European species and to the American species which I have examined. There are some Oriental forms, however, which are conspicuous both for their size and bright markings, and here a rather different form occurs. In *Ochodæus maculipennis*, for example, the organ is not club-shaped, being widened instead of narrowed at its base, and the projections take the form of short, sharp oblique ridges at its extremity (Pl. XXXVI, figs, 3, 3*a*, 3*b*).

Another of the peculiarities of this genus may be related to the vocal apparatus. Each of the four posterior legs bears a pair of long spines at the extremity of the tibia, and upon the middle tibia the inner one of these spines is particularly long and stout and upon one side is deeply notched so as to form a comb, quite unlike anything known in any other beetles. An important function of the legs of most insects is that of cleaning the body, and from its position it seems not improbable that this remarkable comb may serve to remove any adhering particles from the stridulating organs, to which naturally absolute cleanliness is essential and the nature of whose surface must make them rather difficult to clean.

We now come to the Geotrupidæ, of which the familiar type, *Geotrupes*, was one of the earliest insects to have its musical power recorded. The instrument in this genus is very similar to that of *Idiostoma* just described, the file being found upon the hind coxa and having the form of a narrow oblique bar made up of microscopic ridges. But the situation is not the same, for whereas in *Idiostoma*, as in the true Orphnidæ, it occupies the outer end of the coxa, in *Geotrupes* it is at the inner end. It seems in all the species to be scraped by the hinder margin of the socket, which forms a sharp edge. Landois, in his "Thierstimmen," speaks of a "*Geotrupes splendidulus*" which is without the instrument, but I have been unable to discover what he referred to. I believe it to exist in all species of every section of the genus, defined in its widest sense, and to differ only in the degree of fineness of its component ridges, and consequently in the pitch of the note produced. For instance, the instrument is moderately fine in *Geotrupes stercorarius* and *mutator*, coarser in *G. sylvaticus*, *alpinus* and *hiostius*, and very fine in *G. Typhœus* and *retusus*.

Finding the organ so constant through the very various species of *Geotrupes*, I anticipated that it would be found more or less general in the family Geotrupidæ, but was surprised to find it elsewhere only in a group of Australian species of the genus *Bolboceras*: e. g. *B. Reichei*, *rhinoceros* and *frontale*. I subsequently found that so long ago as 1865 the collector Odewahn had reported that an Australian species of *Bolboceras* produced "a noise like a Longicorn, by moving the small pulvilli beneath the hind coxæ." This was recorded by Pascoe,* who did not identify the species referred to, and who afterwards † tried to amend this very curious explanation by the scarcely more exact statement that "striæ are visible on the dorsal surface of the coxæ, and similar but smaller striæ within the cavity." The organ is really a modification of that characteristic of *Geotrupes*, perhaps a more primitive condition. Instead of the single oblique roll of closely-packed ridges upon the hind coxa of the latter we find the ridges arranged in a series of wavy bands from four to eight or nine in number. In *Bolboceras Reichei* (Pl. XXXVI, fig. 8) there are four bands approximately equal and parallel, composed of

* Proc. Ent. Soc., 1865, p. 81.
† *Op. cit.*, p. 107.

ridges much less fine and close than those of *Geotrupes stercorarius*. In *B. frontale* (Pl. XXXVI, figs. 7, 7*a*) the bands are more numerous, and very unequal and irregular. They occupy the whole centre of the inner face of the coxa, and their component ridges, which are fine and close near the upper edge, become gradually less so as they recede. These short ridges do not anywhere produce the appearance of "striæ," nor are there any striæ in the coxal cavities, but within the posterior margin of each cavity is a single slightly oblique chitinous fold, so sharply elevated as to cause a slight depression behind it, in which are a few long hairs.

The genus *Bolboceras* is a very large one represented in all the great land areas of the world, but it is remarkable that, so far as my observations have gone, there is no trace of similar apparatus in species inhabiting any other country than Australia, nor is it found in the majority of Australian species. My inquiries have not produced any further information as to the vocal powers of the genus, nor is much known as to the habits of the species, which are very retiring. I have found records by French naturalists, however, of the possession of the faculty by *Bolboceras gallicum*, which have led me to make a thorough examination of that species. As a result I have arrived at the conclusion that sound is here produced by means differing entirely from any hitherto known to entomologists, viz. by friction between certain parts of the wings and abdomen.

M. Fabre, in his "Souvenirs Entomologiques" (1900, p. 182), describes the species mentioned as uttering a sound which is very faint but much more sweet and musical than that produced by any other beetle known to him; but he does not seem to have formed any opinion as to the part of the body from which the sound proceeded. An earlier record, in Mulsant's "Coléoptères de France" (Lamell., p. 352), states that Solier was led to discover a specimen of the same species by the loud sound it uttered, but this is not consistent with M. Fabre's more precise account and, as a second-hand report, must be received with reserve. The structures which I believe to constitute the musical equipment of this and allied species of its genus do not appear capable of producing much volume of sound.

An examination of the upper surface of the abdomen

(Pl. XXXVI, fig. 9*b*) with a lens shows that the posterior part (that is, all but a narrow anterior strip) of each of the three segments preceding the terminal one has a peculiar opaque surface, and under a high power it may be seen that this is due to the presence, entirely confined to these areas, of an immense number of short stout chitinous spines, all directed towards the middle line of the back, where there is a distinct parting. The spines are sharply limited in their extent by a straight line a little behind the front edge of each of the three segments to which they are peculiar. These do not come into contact with the elytra, but are covered by the rather voluminous wings, which when not in use are folded twice, so that the outer margin of each approximately forms a letter N, that of the left wing represented by the letter reversed. The two wing-tips thus cover the end of the back where the spiny areas are situated. Upon examining this part of one of the wings under the microscope I discovered a small patch of spines adjoining the costal vein just before the extremity of the wing (Pl. XXXVI, figs. 9, 9*a*). These spines seem very strong and rigid and are quite different to those upon the back, much longer and more scattered. They are evenly distributed, however, and entirely confined to a small longitudinal strip, all being directed backwards so that the instrument must be operated by the end of the body being drawn across the wing-tips from back to front, pressing them against the elytra as a support to the delicate membrane. I have found no trace of these remarkable wing-areas except in *Bolboceras gallicum* (the species heard by both Solier and Fabre) and the two closely-related forms, *B. unicorne* and *bocchus*. The sound produced by this means could hardly be other than faint and soft as described by Fabre, and indeed had I not found the musical habit recorded I could only have described these structures as musical in their function with considerable hesitation. It is a further satisfaction to me to have found additional confirmation in the recently published observations of another writer, Herr Verhoeff. In the "Sitzungsberichte der Naturforschenden Freunde zu Berlin" for 1902, Herr Verhoeff records that he has found several species of *Geotrupes* to produce sound supplementing that of the coxal organs by friction between the elytra and certain spinose areas upon the dorsal surface of the abdomen corresponding with

those I have described in *Bolboceras*, but of much less extent. The author referred to considers the primary function of the spines to be connected with the folding of the wings, but he has traced to them rustling sounds which he believes also to have significance. Probably the first object of these spines in all cases was to give strength to the integument without destroying its flexibility, and whatever other uses they may have acquired it will not be doubted, I think, that in the species of *Bolboceras* just mentioned there has been a special adaptation for the purpose of sound-production. In *Geotrupes* the dorsal spines are reduced to very small masses at the extreme margins of the segments, but the observation that in this undeveloped condition they give rise to a sound is of very great interest, showing that they constitute the germ of a musical apparatus whose development might reasonably be anticipated in allied insects devoid of any other instrument for the purpose.

It is best to await observations of living individuals before attempting to determine the extent to which musical powers prevail among the numerous species of *Bolboceras*. Probably most are dumb or produce only very slight sounds. Although I have only found the definitely localized wing-spines in the species mentioned, there are in others short stout spines distributed over a great part of the wing. In others these are entirely absent. I believe the species of *Odontæus*, a genus scarcely more entitled to separation from *Bolboceras* than several forms still included in it, will be found to utter a quite audible sound. The wings of this, of which a rare representative lives in our own country, are exceedingly large in proportion to its small size, and, even though elaborately folded, entirely cover the back. The whole distal half is crowded with short spines which give a smoky colour to the wings. Short conical spines are usually found upon the stouter membrane which occurs at the anterior edge of the wings of Lamellicorn beetles just beyond the point at which folding takes place. These in the Passalidæ have been found to take part in the production of sound, and it seems to me likely that in *Geotrupes* also it is these surfaces rather than the elytra which, in conjunction with the dorsal areas, produce the sound noticed by Verhoeff.

The Geotrupidæ are musical also in the larva state, but

here we meet with an entirely new and most interesting type of organ. The jaws have no stridulatory surface, but the legs bear structures elaborately adapted to the purpose. If a larva of *Geotrupes* is taken between the fingers it will invariably begin to fiddle, and, although its note is only audible to the human ear at a short distance, the means by which it is produced is easily seen by close attention to its movements. Every note is accompanied by a jerking movement of the last pair of legs straight forward and against the bases of the second pair. The last pair are reduced in size and, from the change they have undergone in the manner of their articulation in order to perform the forward movement, have probably ceased to have any other use. Indeed, the larvæ of Lamellicorns in general have little use for their legs, commonly lying on their sides in a doubled-up condition among the root fibres, rotten wood, or other substance upon which they feed. A modification of the legs for the performance of a new function is therefore attended by no corresponding disability. The joints of these modified legs seem to have retained little power of separate movement, but extending from base to tip on the inner side is a row of very hard sharp-pointed prominences or teeth. This represents the fiddle-bow, while the strings are formed by a beautiful series of fine ridges occupying a pear-shaped area on the coxa of each of the two intermediate legs. These ridges, according to Schiödte, are very complex in their microscopic structure, being finely serrated at their edges.

Although this apparatus of the *Geotrupes* larva shows a great degree of modification of the hind-legs, in another family, the Passalidæ, these have undergone a much further development. This family of beetles, although the extraordinary facts of their economy are as yet scarcely known, is among the most remarkable of Insect groups.

The larvæ of Passalidæ, unlike those of all other known Lamellicornia, are active, the body being straight instead of curled, and the legs are long, enabling them to walk at a fairly quick pace. At first sight these exceptional larvæ appear to be quadrupeds, a careful examination being necessary for the discovery of the traces of the third pair of legs, which are reduced to a pair of tiny appendages ending in four or five claw-like processes, and in some species having a curious resemblance to a pair of outspread hands. They lie close to a minutely-ridged area

on the coxæ of the preceding pair of legs, the vibratory edges of which are plucked by the finger-like processes. It is remarkable that this much-modified remnant of a leg reappears in the mature beetle as a perfectly-formed limb, practically like the second pair, and having no other function than that of progression, while the vocal apparatus appears in an entirely different form and position. The fact of stridulation by the adult beetle seems to have been first published by Dr. Leconte, but Professor Poulton has kindly sent me a much earlier record found by him amongst the hitherto unpublished notes of the traveller Burchell, and dated Dec. 9th, 1826. This very careful observer writes of species of *Nelcus* and *Veturius* which he found at Rio las Pedras, Cubataõ, Brazil, and believed, no doubt, to belong to a single species:—"On taking it in the hand it makes a faint [sound] between a hissing and a squeaking, like the *Lamiæ*." The sound produced by both larva and beetle is described by Dr. Ohaus as very distinctly audible, but the means by which it is produced in the latter have been the subject of several different opinions. It has been most generally supposed that the abdomen and elytra were the parts concerned, but none of the regions pointed out as directly participating show any real co-adaptation for such a function. There is no doubt that the true explanation is that given by Mr. G. F. Babb, of Massachusetts, in the "Entomological News" for 1901. The purpose is achieved by the opposition of spinose areas upon the wings to spines upon a pair of elevations towards the end of the abdomen, that is, by means somewhat similar to those which I have described in species of the genus *Bolboceras*. The two terminal segments of the abdomen are rigid above, but the one preceding them is membranous and flexible, with the exception of a much-thickened strip at its hinder border. Connected with each end of this chitinized strip there is a hard boss the surface of which has a velvety appearance, which proves under the microscope to be due to erect spines massed thickly together. These bosses occupy almost the same position as the peculiar processes which I have described in *Ochodæus*, although owing to the long and narrow shape of the body they are nearer together and more terminal and are covered by the wings. Each of the latter lies closely against the flattened surface of the wing-cover, and the hard angle formed at the

single fold fits into a rather deep pit so that additional rigidity is secured. The part of the wing overlying the spinose boss is in this region, and it is here that very short erect spines are found upon the wing membrane. As in *Bolboceras*, the primary use of the wings remains quite unaffected in the North American species of *Passalus* (*P. cornutus*) studied by Mr. Babb, and indeed in the great majority of the family, all of which probably have musical powers; but in various Tropical American genera the wings have become quite useless for the purpose of flight and undergone a further development for the new function. They are reduced to narrow strips of stiff leathery membrane shorter than the elytra. In *Proculejus* and some other related forms the hinge and the small spine-bearing area just behind it are present, but the whole of the wing beyond has disappeared, and the hinge having lost its use is no longer movable. This strange transformation has reached its furthest development in the three great species forming the Central American genus *Proculus*, to which my attention was first directed by Dr. David Sharp. The hinge has entirely vanished, and the wing-remnants are quite opaque and straight and lie in depressions in the elytra. These depressions are deeper at the posterior part, and the corresponding part of the wing-strip has its margins thickened above, so that the intervening part of the membrane is slightly raised and forms a drum. To use a more precise parallel the whole device forms the resonating box of the fiddle. The outer (or lower) side of the stretched membrane bears closely-set pointed teeth of conical shape. The corresponding abdominal bosses are similar to those of less profoundly modified members of the group, and indeed have practically the same form throughout the family.

We can only conjecture what manner of sound is generated by this remarkable apparatus, for of the numerous collectors who have captured the insects, in this case larger than the largest beetles of our own country, none has given any account of its habits. As regards the smaller forms with normal wings belonging to *Phoronæus* and related genera, Dr. Ohaus has supplied the deficiency, having published in the "Stettiner Entomologische Zeitschrift" for 1900 (p. 164) an account of his observations in Brazil, which constitutes one of the most interesting contributions made for many years to our

knowledge of insect economy. One of the beetles is there stated to have chirped so loudly when confined in his room at night that he was unable to sleep until it was put outside. Having had considerable success in rearing the larvæ of other Lamellicornia, Dr. Ohaus tried to rear those of Passalidæ in the same way, many species being very common in the neighbourhood of Petropolis; but to his surprise they invariably died in a few days. Determined to discover the reason of his failure, he devoted himself for a time to the investigation of their natural conditions of life, and soon observed that when a rotting trunk contained tunnels inhabited by the larvæ, a pair of adult beetles was invariably to be found at the end of each tunnel, each pair accompanied by from two to seven young ones. Transferring the entire family to his breeding-cage, he found that they then fared perfectly well. If individuals from different places were put together they refused to settle down and soon died or killed each other, but by keeping each family by itself he had no difficulty in following out their history. The adults were usually occupied in disintegrating the wood at the far end of the burrow and chewing it into a soft condition ready for the larvæ, the condition of whose jaws seems to render them incapable of procuring their own food. Even when kept apart from their parents and the material prepared by the latter supplied to them, they did not prosper, and Dr. Ohaus considers it probable that a digestive secretion is mixed with it before it is given to them. The beetles devote constant attention to their offspring from the time they leave the egg until full maturity is reached, for even after the young beetle has assumed its final shape the jaws are for some time too soft for it to feed without parental assistance. Both larval and adult Passalidæ stridulate loudly and constantly, and in these organized communities it seems to be undeniable that the vocal powers serve the purpose of intercommunication. Dr. Ohaus records an interesting episode which may be quoted as a proof of this.

Breaking up a log in search of larvæ of another group he disturbed a community of Passalidæ consisting of the parents and six larvæ. Not wishing to keep these he put them on the ground and went on with his search. Having finished this he was preparing to leave when another log near by attracted his attention, and he turned it over.

Beneath it were the two beetles and four of their brood, while the other two were making for the same shelter as fast as intervening obstacles would allow. The chirping of the whole party had all the time been audible, and my friend is convinced that the larvæ were guided by this means into safety, exactly as chickens are by the clucking of their mother. As they are without trace of eyes it is difficult to resist this conclusion.

In spite of the complex social relations long known to exist among the Hymenoptera and other insects, an organized family life such as this would a short time ago have appeared an almost startling discovery among beetles; but recent observations of the social life of many Scolytidæ by an American naturalist, Mr. H. G. Hubbard, have shown that the prevailing idea of general individualism in the Coleoptera is incorrect, and there is little doubt that more study of the living insects would lead to the discovery of many as yet unsuspected cases of social life in the order. It seems likely from Mr. Shelford's observations in Borneo that the extraordinary Carabid beetle *Mormolyce* will be found to afford a case similar to that of the Passalidæ.

The last family of Lamellicornia of which the vocal faculties remain to be investigated is that of the Stag-beetles (Lucanidæ). The larvæ of these are short-legged grubs incapable of walking, but lying always in a bent position, generally within decaying stumps. They are quite independent, however, each steadily eating his way through a burrow of his own, and the duties of the mother end with the deposition of the eggs in a suitable situation. It is probable that stridulation is universal among these larvæ, of which there are species in all parts of the world —at least Schiödte has found the apparatus in all the four European genera, which represent four widely-separated divisions of the family.

If a larva of the common Stag-beetle (*Lucanus cervus*) is held in the fingers it will utter a squeak, and it can be seen that the movement by which this is done is the same as in *Geotrupes*, that is, the last pair of legs is worked backwards and forwards across a space at the base of each of the second pair; but examination shows that the functions of the two opposing surfaces are reversed. The space at the base of each intermediate leg is not ridged, as in both *Geotrupes* and Passalidæ, but irregularly studded with

pointed horny tubercles (the plectra), while the actual stridulatory plate is on the second joint (trochanter) of the hind-leg. This joint has undergone a great development to adapt it to the purpose. It is drawn out into a slender process, so that the succeeding joint seems to arise from the middle instead of the end of it, and on its inner side is a curved ridge running its whole length and cut transversely into a large number of sharp-edged plates. According to Schiödte these delicate plates are themselves finely serrated in a rather complex manner. By the movement of the legs described this elaborate instrument is drawn across the tubercles upon the coxa of the preceding leg in a direction at right angles to the ridges.

An apparatus practically the same as this occurs in the larvæ of the three other Lucanid genera examined by Schiödte, *Dorcus*, *Platycerus* and *Sinodendron*, but in the last the ridges, although fine and sharp, are less regular than in the others, and the coxal tubercles form rows at the narrow part of the plate in this genus, which is one of the least typical members of the family. We may fairly assume from the constancy of the organ in these representative genera that the same highly-elaborated structure is possessed by the larvæ of all the Lucanidæ. It is therefore rather strange that the adult beetles are in general dumb. Only a single species has been found to stridulate in this stage of its existence. This is *Chiasognathus Granti*, a large insect found to produce a loud sound by Darwin in South America. Darwin seems to have assumed that the faculty was characteristic of the male only, but this is not the case, for I have found the same apparatus in both sexes. I believe it is peculiar to this single species, and nothing of the same type is found in any other Lamellicorn genus. Just within the external margin of each elytron on the lower side is a thick roll of hard chitin distinguished from the rest of the surface by its reddish non-metallic colour. This roll is deeply and finely divided transversely, so that it has the appearance of being a chain of horny rings. The hind femora are flattened beneath and have a slight upward curvature enabling them to be pressed against the flanges of the elytra, and at the part where the contact occurs each shows several longitudinal scratches of which the edges project sharply. By working the leg of a dead specimen backwards and forwards against the sides the scraping of

these projecting ridges can be heard to produce a very audible squeaking noise.

Although *Chiasognathus Granti* is the only known case of a single species standing alone in a large family as a stridulator and may yet be found to have companions, yet the apparently erratic manner in which stridulating organs are distributed is very remarkable, as is the fact of the much more general possession of the organs by the larvæ of the Lamellicornia than by their parents. It is vain to attempt the explanation of these phenomena until we know more about the real significance of stridulation. Dr. Ohaus' observations as to stridulation in beetle communities are of the greatest interest, but it would be rash to draw any general conclusions from them, for we are obliged to regard such communities as exceptional, and it is easy to imagine that structures having a quite other primary significance may have become the means of intercommunication in insects whose nervous organization has reached an exceptional degree of development.

Taking a general survey of the vocal organs here described, the most noticeable feature is the great variety of situation they affect in the Lamellicorn group, at least in the adult stage. Those of the larvæ fall into three series, viz. the Lucanid group, in which the stridulating plate is on the hind trochanter, the Geotrupid group (of which the Passalidæ exhibit the extreme development), in which it is on the middle coxa, and the Scarabæid group, embracing the great mass of Lamellicornia, where the jaws bear the vocal organs. These larval organs show at least as profound anatomical modifications as any occurring in the mature beetles, and being constant throughout great groups, as we are justified in supposing them to be, they must be considered more ancient, and therefore of greater significance in classification, than those of the adult insects.

In the latter the stridulatory file is found at the outer margin of the elytra in *Chiasognathus* (Lucanidæ), on the hind coxæ in Geotrupidæ, Orphnidæ and the genus *Heliocopris* in the Copridæ, in the corresponding region of the socket in the Taurocerastidæ, on the inner margins of the elytra in *Trox* and *Copris*, on their lower surface in *Ligyrus* (Dynastidæ) and *Ochodæus*,—although there is no similarity in the last except in position, the organ in *Ligyrus* being apparently rather imperfect, while in

Ochodæus it is highly specialized. The very remarkable complementary structure in this isolated genus has no nearer homologue than the spiny stridulating bosses of the Passalidæ, which, as in the former case, occupy the ante-penultimate dorsal segment. Less localized but similar areas occur upon the back in certain Geotrupidæ not provided with coxal organs. With the exception of *Phileurus*, in which I believe the method used to be similar to that of the Geotrupidæ just mentioned, and *Ligyrus*, all stridulating Dynastidæ bear vocal ridges upon the propygidium; those of the Rutelidæ are near the ends of the femora and those of the Cetoniidæ beneath the abdomen. In the only known stridulating Melolonthid genus, *Scrica*, the ridged plate is within the prosternum.

APPENDIX.

Systematic notes and descriptions of Lamellicornia *referred to in the foregoing paper.*

Certain of the beetles just dealt with being hitherto unknown or little studied, it has been necessary to use new names and even to form fresh groups, and I have therefore to supplement what has been said by more comprehensive technical descriptions of these. It will be convenient also to consider here the bearing of the facts already dealt with upon the inter-relationships of the groups of Lamellicorn beetles, concerning which stridulating organs seem to me to afford evidence of some importance.

The classification of the species of *Ægidium*, one of the genera in which I have found stridulating organs, is in a state of some disorder. I have pointed out in a former paper that the Central American insects ascribed by Bates to *Ægidium colombianum* do not belong to that form, and I have since found that the name *Æ. asperatum* was given by De Borre the year previously to what is evidently a not well developed specimen of the same species from Ecuador. The type of *Æ. Reichei* of De Borre is probably only a very small individual of the same species,—at least no differential characters are described.

Æ. guianense of Westwood has been re-described under the name of *Æ. Steinheili* by Harold, the original of Westwood's description (I have been able to compare the types of both authors) being a female. This form however does not properly belong to the genus, and I have therefore formed for it a new genus which I shall name

Ægidinus, gen. nov.

Corpus breve, haud depressum : clypeus antice productus : mandibulæ apice fissæ, extus lobo prominente munitæ : coxæ posticæ deplanatæ, area stridulatoria transversa prope marginem lateralem præditæ.

♂ clypeus apice cornu erecto armatus : prothorax antice late excavatus, dente obtuso ante marginem anteriorem.

Alia quoad in gen. *Ægidium*.

The stridulating apparatus and other features are as in *Ægidium*, the differential characters being the differently shaped head, the lobed mandibles and, in the male, the horn into which the clypeus is produced and the excavation of the thorax, which is confined to its anterior part. The genus bridges to some extent the interval between *Ægidium* and the Old World genus *Orphnus*. *Orphnus Strobeli* of Steinheil may perhaps belong to it. There is another form, closely related to *Æ. guianensis*, which was found by Bates in the Amazonian region and believed by him to be Westwood's species. I shall name this

Ægidinus brasiliensis, sp. n.

Convexus, niger, nitidus, corpore subtus, antennis, palpis pedibusque rufis ; capite fere lævo, antice acuminato, paulo concavo ; prothorace polito, punctis nonnullis lateraliter sparsutis, marginibus lateralibus valde curvatis, angulis anticis paulo acutis, posticis obsoletis ; scutello parvo, impunctato, quam latitudinem longiore ; elytris brevibus, lateribus ab humeris ad apices regulariter curvatis, stria suturali lineisque punctorum vagis ; marginibus omnibus corporeque subtus longe fulvo-setosis, metasterni medio læve ; coxis læte rufis, fere impunctatis ; mandibularum lobo externo longo.

Long. 8·5 –11 mm.

Hab. Brazil, Ega.

This has the same general form and appearance as *Æ. guianensis*, but is rather smaller and is easily distinguishable by its much greater smoothness. The head is

impunctate and the thorax and elytra thinly and vaguely punctured. There is no supplementary inner tooth to the front tibia of the male, which forms a further distinction between the two species, the male of *Æ. guianensis* having a small tooth upon the inner side of the terminal one.

A pair of *Æ. brasiliensis* has been presented to the British Museum by M. René Oberthür.

The new genus which I have called *Idiostoma* has no near relationship to any other form yet known and must be regarded as forming a new sub-family.

Idiostoma, gen. nov.

Corpus crassum, ovatum: caput parvum, cornutum; trophi degenerati, labrum minutum; maxillæ unilobatæ; antennæ 10-articulatæ, articulis 1–2 globosis, hirsutis, 3–7 brevissimis, 8–10 clavam parvam componentibus: corpus subtus pedesque longe fulvo-hirti, hæc robusti; coxæ posticæ haud latæ, costa stridulatoria prope extremitatem externam prædítæ.

The clypeus is very small and bidentate in front, the eyes large but not prominent laterally, their upper part being capable of complete retraction within the prothorax. The buccal organs are greatly reduced and without biting parts. The labrum is exserted but very small and fleshy, the mandibles are without teeth, the tips blunt and produced forward, the inner edge membranous, and the maxillæ are without a lower lobe, long and fleshy. The last joint of the palpus is longer than the other two together. The mentum is small and semicircular without a distinct ligula. The last joint of the labial palpus is long, the others small. The antennæ are small and 10-jointed, the outer lamellæ of the 3-jointed club being slightly cup-shaped.

The body is short, stout and thickly clothed beneath with long tawny hairs. The front coxæ are very prominent, the middle discoidal, the hind stout, with a narrow transverse stridulating file near the outer end. The femora are stout, the anterior tibiæ tridentate, with a very long spine, which is strongly spatulate in the male, and the four posterior tibiæ very strongly conically expanded at their extremities, each armed with two long terminal spines. The tarsi are slender. The abdomen is much reduced and almost entirely covered by the elytra, and consists ventrally of six visible segments.

There are two species of this anomalous genus in the British Museum, of which the typical one is diagnosed as follows:—

Idiostoma rufum, sp. n.

Plate XXXVI, fig. 1.

Rufum, obesum, capite parvo, rugoso, antice bidentato, fronte tuberculo, fœminæ obsoleto, maris modice recurvato-producto, armato; prothorace grosse sat crebre punctato, medio longitudinaliter canaliculato, fœminæ leviter, maris profunde, hujus excavationis lateribus utrumque acuminatis, prothoracis lateribus valde curvatis, angulis anticis obtusis, posticis obsoletis; scutello acuminato, lævi; elytris valde convexis, politis, sulcatis, interstitiis minute haud dense punctulatis, intervallo suturali antice et postice contracto.

Long. 12–16 mm.

Hab. W. Patagonia, Valle del Lago Blanco.

The Museum possesses a number of specimens, most of them males, of this interesting insect, brought from the eastern slopes of the Andean chain. All are of a reddish-chestnut colour, thickly clothed beneath with tawny hair. The thorax is relatively rather small and is rather narrower at its broadest part than the elytra at the shoulders.

The second species is described from a single male specimen acquired many years ago, and, although the distinctive features are sufficiently marked, it is not advisable, until additional specimens are available, to describe it in very great detail lest merely individual features should be taken as characteristic. Our specimen bears the unpublished name of *Medon Patagoniæ*, Reiche, in the writing of the French entomologist Jekel, from whom it was obtained. It may be called

Idiostoma Medon, sp. n.

I. rufi simile sed multo minor: rufo-castaneum, elytris lateraliter pallidioribus: clypeo late truncato, haud dentato: prothorace latius, minus profunde, excavato, excavationis lateribus haud acuminatis: elytris magis æqualiter sulcatis, intervallo suturale vix contracto; calcaribus tibialibus omnibus acutis, maris pedum anticorum haud spatulatis.

Long. 9 mm.

Hab. Patagonia.

In addition to the much smaller size, differently shaped head and thorax and more parallel elytral striæ, our

specimen of *I. Medon* is practically without any hairy clothing beneath, which is probably not entirely due to age.

The general appearance of these insects strongly suggests a position among the Dynastidæ, but their anatomical features entirely contradict this and unquestionably connect them with *Orphnus*, *Geotrupes*, etc. Lansberge, in describing *Drepanognathus* (*Sissantolbius*), a genus of the same group, has stated that the true relationship of these insects is with the Dynastidæ, but this is to ignore the most vital structural differences, such as the situation of the spiracles, the development of the labrum, etc., in addition to the entirely distinct stridulating organs, of which of course he was ignorant.

The remarkable genus *Ochodæus* evidently contains a large number and variety of forms and is very widely distributed, but, no doubt owing to a peculiar and retiring way of life, they are rarely found and our knowledge of them is very scanty. It will probably be necessary eventually to subdivide the genus, but this is not desirable until we have acquired a completer knowledge of the species. I have described the very curious musical apparatus of certain new forms for which it has been necessary to devise distinctive names, and these must be characterized here. Representatives of the genus are known from America, Southern Europe, West, East and South Asia, North, South and West Africa and Madagascar. Of about forty described species, however, half are American, and these are all from the part of the continent north of the Equator. The new species which I have referred to by the name of *Ochodæus campsognathus*, however, inhabits Argentina, and it is possible that as additional forms are found this apparent preponderance in one region may prove to be only apparent. Although scattered over such a large part of the world the genus shows remarkably little variation in general form, size or coloration. The Oriental species alone, of which few have yet been described, seem to have revolted from the general sobriety of their kind, and amongst these are some of rather peculiar and striking appearance. They are often distinguished by dorsal markings of red and black, and some show a disproportionate development of the front part of the body, probably signifying correspondingly great burrowing powers. *Ochodæus maculatus*, Waterh., one of these which inhabits Japan, is the finest

species of the genus as yet described, and nearly related to it is an insect from Java in the British Museum to which I propose to give the name

O. maculipennis, sp. n.

Plate XXXVI, fig. 3.

Brevis, rufo-fulvus, corpore supra ubique granuloso-rugosus et dense fulvo-setosus, prothoracis marginibus antico et postico, scutello elytrisque nigris, utroque elytro fascia transversa irregulare anteriore maculaque discoidale apicale ornato: capite magno lato, clypeo parvo, carina arcuata tuberculisque duobus lateralibus paulo elevatis; prothorace valde transverso, quam elytra ad humeros multo latiore, antice profunde emarginato, angulis anticis acutis, posticis obsoletis, margine postico late lobato, sulco longitudinale antice abbreviato carinaque tenue transversa sinuata postice prædito; scutello magno, longitudine plus quam elytrorum partem quartam, apice acuminato; elytris brevibus, distincte punctato-striatis, interstitiis subtiliter rugosis; corpore subtus pedibusque testaceis, longe hirsutis, tibiis anticis dente minuto tertio exacte inter secundum atque basin medio posito, tarsis gracilibus, pedum posticum articulo primo ad reliquos conjunctim æquale; antennarum clava* maxima cordiforme.

Long. 10·5 mm.

Hab. Java.

This is about equal in size to the Japanese species referred to, but whereas that is black, with the femora and dorsal markings red, the new species is red with the exception of the scutellum and the greater part of the elytra. *O. grandiceps*, Fairm., from China, is another allied form similarly coloured to *O. maculipennis*, but it is smaller, and like *O. maculatus* bears a pair of tubercles at the front of the clypeus which are absent in the new species. The large sharply-pointed scutellum is another distinctive structural feature. The dorsal stridulating appendage has the form of a horizontal plate attached by a broad base to the abdominal segment and having at its inner end several highly chitinized ribs which terminate in short finger-like processes.

The single male specimen described was formerly contained in the Bowring Collection.

The following species is more of the normal form and size, but is notable for its very long and thick tawny clothing and the pattern of chestnut and black with which it is decorated.

* This has been represented much too small in the figure.

O. decoratus, sp. n.

Ovatus, omnino longe fulvo-hirtus, rufo-castaneus, capite fere toto nigro-cincto ; prothoracis puncto laterale maculisque tribus discoidalibus nigris, duabus magnis anterioribus postice productis tertiaque minore ante scutellum ; hoc nigro ; elytrorum lateribus, sutura, apicibus fasciaque media completa nigris ; clypeo parvo, carina nigra cujus extremitatibus paulo tuberculiferis, fronte grosse granulato ; prothorace crebre punctato-rugoso, punctis majoribus intersparsis, angulis anticis acutis, posticis fortiter arcuatis, margine postica late lobata ; scutello sat magno ; elytris profunde punctato-striatis, punctis magnis, nigris, interstitiis subtiliter rugosis ; corpore subtus cum pedibus antennisque rufo-fulvis, harum clava magna, cordiforme ; tibiæ anticæ valde bidentatæ, dente tertio minuto fere ad basin posito, tarsis omnibus sat gracilibus, posticorum articulo primo ad sequentes longitudine æquale.

Long. 6·5 mm.

Hab. Penang.

Of this also we have only a single male example, which was found by the late Mr. Lamb. The hinder part of the body is not so much reduced, nor the head proportionally so large, as in the previous species, and the insect is altogether smaller, but it is closely allied notwithstanding. The coloration is analogous, but the thorax has five black patches upon a reddish ground. The pubescence with which the whole surface is clothed is very coarse and the scutellum is rather less large in proportion than that of *O. maculipennis*. The stridulating appendages are of similar form but without the short terminal processes.

O. campsognathus, sp. n.

Plate XXXVI, fig. 2.

Testaceus, hemisphæricus, ubique breviter setosus, capite brevissimo, rugoso, inter oculos carina fere angulata, post hoc sublæve, mandibulis magnis, paulo tortis, apicibus oblique antice directis, labro lato, paulo emarginato ; prothorace dense rugoso, postice medio breviter longitudinaliter impresso, angulis anticis acutis, posticis arcuate rectis ; scutello acuminato, parce punctato, elytris profunde striatis, striis confluenter punctatis, interstitiis irregulariter haud crebre punctatis, singulo elytro ante apicem sinuato ; propygidii margine posteriore dentibus duobus sat distantibus munito ; corpore subtus ubique dense flavo-setoso ; tibiis anticis dentibus maximis duobus tertioque minuto intra secundum et basin exacte

intermedio armatis ; appendiculis dorsalibus stridulatoriis fusiformibus.

Long. 6–7·5 mm.

Hab. ARGENTINA, Chaco, and Rio las Garzas.

There are six specimens which appear to be all females. They may perhaps be most conveniently compared with the European *O. chrysomelinus*, F., the general form and size being similar. This species is much less finely and closely rugose than that, the elytra are more deeply striated, the clypeus is very small and not distinctly marked off from the rest of the head, and the jaws are considerably longer, their tips unequal and rather blunt and their outer margins irregular.

Hitherto only a single species of *Ochodæus* (*O. rugatus*, Westwood) has been known from South America. In the British Museum collection, in addition to that insect and *O. campsognathus*, there is a specimen of yet a third which it will be well also to characterize.

O. tridentatus, sp. n.

Ovatus, pallide testaceus, sat nitidus, vertice, prothorace, sutura, corporeque subtus obscurioribus, clypeo modice producto, grosse rugoso, longe setoso, fronte grosse, haud crebre, punctato, oculis magnis ; prothorace grosse et regulariter punctato, antice paulo angustato ; scutello sat angusto, acuminato ; elytris fortiter punctato-striatis, interstitiis impunctatis, parce granulatis, cum prothorace subtiliter flavo-setosis ; elytrorum apicibus sinuatis, angulis fere spiniformibus ; propygidii margine posteriore medio retuso, bidentato ; pedibus flavis, tibiis anticis tarsisque obscurioribus, illis tridentatis, dentibus æquidistantibus ; tarsis anticis gracilibus, reliquis sat robustis.

Long. 8·5 mm.

Hab. COLOMBIA.

The type was derived from the Reiche collection, where it bore the unpublished name "*æquinoctialis*, Dupont." The species is rather less short and globose than usual. The head is not very transverse, the eyes are large and the prothorax is narrowed anteriorly and widens to beyond the middle. The sculpture is everywhere coarse and the setose clothing is inconspicuous both above and beneath.

Ochodæus was associated by Erichson with *Orphnus*, *Hybalus* and *Ægidium* in a family (Orphnidæ) which he

placed between the Hybosoridæ and Aphodiidæ. The last three genera, however, he placed in closer relation to each other than to the first, whose various peculiarities of structure give it an isolation which the discovery of the stridulating apparatus of all the genera makes still more conspicuous. This apparatus is exactly analogous in all the other genera and absolutely different to that found in *Ochodæus*. The similar discovery in *Taurocerastes* and *Frickius* tends to justify the otherwise unnecessary creation by Germain of a separate family (Taurocerastidæ) for those two genera, while the new genus *Idiostoma* just described has at least an equal claim to family rank. Unfortunately the larvæ of all these interesting forms, which should throw valuable light upon the degree of their relationships to each other and to other Lamellicorns, are entirely unknown. All the genera, however, seem to me to have closer relationships with the Geotrupidæ than with any other family, and the alternatives which present themselves to me are either still further to multiply the family divisions in order to retain those now in existence, or by somewhat extending the definition of the Geotrupidæ to include all in a single family and regard the various divisions as sub-families only. In the absence of full data to justify the former course and in view of the differing conceptions of entomologists as to the proper value to be assigned to a "family" in the Coleoptera, it seems to me desirable rather to reduce than multiply such groups where common characters exist, and in the present instance I believe that a greater degree of uniformity will be introduced among the families of Lamellicornia by regarding the small groups here dealt with as comprehended in a single family.

The Aphodiidæ and Hybosoridæ seem to be entirely without stridulating organs in the adult form, while those of the larval Aphodiidæ seem to associate them with the Copridæ. The Hybosoridæ are rather doubtfully homogeneous, but have probably nearer relationships to the Trogidæ and Glaphyridæ than to the groups now under consideration.

Practically the only characteristic distinguishing the Geotrupidæ as hitherto restricted is the possession of eleven joints in the antennæ, a feature which, although exceptional and important as evidence of the primitiveness of the group, cannot be regarded, in view of the variation in the

number of antennal joints occurring in nearly all Lamellicorn families, as affording the criterion of a really equivalent group. In the extended sense here proposed the Geotrupidæ are characterized by a small clypeus which leaves entirely exposed the extruded labrum, large more or less crescent-shaped mandibles, six movable ventral segments and all the pairs of coxæ in close proximity. It may be expected that all the larvæ will be found to have the legs adapted for the purpose of stridulation as in those of the genus *Geotrupes*, the only one as yet examined.

The sub-families may be classified as follows :—

a Antennæ 11-jointed . . . . . *Geotrupinæ.*
(*a*) „ 10- „
  b Mouth parts well developed : mandibles and maxillæ toothed.
    c Stridulation ventral : tibial spines simple.
      d Stridulating plate on hind coxæ . . *Orphninæ.*
      (*d*) „ „ in hind coxal cavity *Taurocerastinæ.*
    (*c*) Stridulation dorsal : a pectinate spine to middle tibia . . . . . *Ochodæinæ.*
  (*b*) Mouth parts degenerate: mandibles and maxillæ without teeth . . . . . *Idiostominæ.*

The Idiostominæ consist of the two species of *Idiostoma* alone and the Ochodæinæ of the single large genus *Ochodæus*. The three species belonging to the genera *Taurocerastes* and *Frickius* form the Taurocerastinæ, and the Orphninæ include *Hybalus*, *Orphnus*, *Ægidium*, *Ægidinus*, *Sissantobius* (*Drepanognathus*), and a few other genera unknown to me.

According to recent views upon the classification of the Coleoptera the primary divisions of the Lamellicornia are the Passalidæ, Lucanidæ and Scarabæidæ, the last corresponding to the whole of the Lamellicornia of Lacordaire, who separated the first two divisions under the name of Pectinicornia. In Gemminger and Harold's Catalogue the Passalidæ are actually merged in the Lucanidæ. The relationship between these two families is not really very close, however, whereas there is a relationship between the Passalidæ and the forms I have comprised in the family Geotrupidæ which has not hitherto been remarked. The two types are certainly distinguished by a wide difference in outward form, the Passalidæ, in correspondence with their highly peculiar manner of life,

having acquired a remarkably uniform exterior, characterized by great elongation and flatness, whereas the Geotrupidæ, in response to quite different habits, have acquired an equally characteristic rotundity. It is therefore to the larvæ that we must look for the best evidence of relationship. I have referred to the very striking fact that the stridulating organs of both larval and adult Passalidæ are highly-developed phases of rather simpler structures occurring in the corresponding stages of Geotrupidæ. In the larva of *Geotrupes* the third pair of legs is much reduced in size and directed forwards in such a way as to scrape a pair of files at the bases of the intermediate legs. In the Passalidæ these files again appear, and the modification of the last pair of legs has advanced to such a degree that they seem to be mere jointless rudiments. It is scarcely rash to prophesy that examination of the yet unknown larvæ of other genera of these groups will reveal intermediate stages in the transition. No apparatus has been found in any other group bearing any greater resemblance to this type than that of the larval Lucanidæ, in which the hind-legs are not at all reduced and themselves bear the file upon the greatly enlarged trochanter. Although the action is similar the structure is widely different. In all other known Lamellicorn larvæ the organs are borne, not upon the legs but the jaws. This single fact therefore, apart from other evidence, affords almost conclusive proof of the relationship between the Geotrupidæ and Passalidæ. But the vocal apparatus of the adult beetles points in the same direction. It is at last established, after much debate, that the Passalid beetle stridulates by the opposition of certain stout spines upon the wings to other spines studding a pair of bosses situated upon the antepenultimate dorsal segment. In the Geotrupidæ again we have found in *Geotrupes* and *Bolboceras* sound-producing spines upon the terminal dorsal segments and corresponding spines upon the wings, and in *Ochodæus* I have described highly peculiar paired projections upon the antepenultimate dorsal segment, to which no other analogues can anywhere be found but the bosses upon the same segment in the Passalidæ. Although the musical apparatus affords the most striking evidence of this unexpected relationship, corroboration is supplied by various other features. Thus in the perfect insects the configuration of the head and

the organs of the mouth, with the broad extruded labrum and mandibles, are common to the two groups. Again, the larvæ of the Lamellicornia are in general more or less closely hairy and the anal opening is simply transverse and exactly terminal. Those of both Geotrupidæ and Passalidæ, on the contrary, are smooth, and in both a pair of lateral lobes appears by which the anal orifice is confined so as to assume a somewhat stellate form. In the Lucanidæ it is again quite different, being longitudinal, and this family, besides many other peculiarities, is distinguished from other Lamellicorns by a much less concentrated nervous system.

The arrangement of Lamellicornia as Passalidæ, Lucanidæ and Scarabæidæ, therefore, does not seem to me to correspond with our present knowledge of the facts. The first family, which is one of the most homogeneous among beetles, must be closely associated with the third, which is by no means homogeneous and consists of an assemblage of families; while I regard the Lucanidæ as the extreme branch of the Lamellicorn series, having only very slight affinities with the Passalidæ, which may be due more to similarity in their mode of life than to any fundamental relationship.

List of Stridulating Genera of Lamellicorn Beetles.

Genera only known to stridulate in the larval stage are not included in this list, as our knowledge of these has not materially increased since the work of Schiödte in 1874. The very numerous genera of *Passalidæ*, in which stridulation is general, are not separately enumerated.

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Explanation of Plate XXXVI.

Fig. 1. *Idiostoma rufum*, Arrow, new species.
1*a*. ,, ,, inner face of hind coxa.
2. *Ochodæus campsognathus*, Arrow, new species.
2*a*. ,, ,, end of abdomen, viewed dorsally.
2*b*. ,, ,, left stridulating appendage.
2*c*. ,, ,, end of right elytron, inside.
3. *Ochodæus maculipennis*, Arrow, new species.
3*a*. ,, ,, abdomen, viewed dorsally.
3*b*. ,, ,, left stridulating appendage.
4. *Ochodæus ferrugineus*, Eschs., left stridulating appendage.
5. *Frickius variolosus*, Germain, abdomen, ventral side.
5*a*. ,, ,, right hind leg, inner side.
6. *Bolboceras rhinoceros*, Macl., right hind leg, inner side.
7. *Bolboceras frontale*, Guér., left hind leg, inner side.
7*a*. ,, ,, portion of stridulatory area.
8. *Bolboceras Reichei*, Guér., left hind leg, inner side.
9. *Bolboceras gallicum*, Muls., right wing.
9*a*. ,, ,, ,, ,, ,, spinose strip.
9*b*. ,, ,, end of abdomen, dorsal side.
10. *Ægidium colombianum*, Westw., right hind coxa, inner side.
11. *Geniates catoxanthus*, Burm., left hind leg, inner side.

December 23rd, 1904.

THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1904.

Wednesday, February 3rd, 1904.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT announced that he had nominated Dr. THOMAS ALGERNON CHAPMAN, M.D., F.Z.S., Dr. FREDERICK AUGUSTUS DIXEY, M.A., M.D., and the Rev. FRANCIS DAVID MORICE, M.A., as Vice-Presidents for the Session 1904–1905.

Exhibitions.

Mr. A. J. CHITTY exhibited two specimens of *Ptinus tectus*, Boisd., taken by him in a granary in Holborn in the winter of 1892–93; also a complete series of the red *Apions* to show *A. sanguineum* from the late Frederick Smith's collection.

Mr. O. E. JANSON exhibited specimens of *Papilio weiskei*, Ribbe, and *Troides meridionalis*, Rothschild, recently taken by Mr. A. S. Meek near the Aroa River in the interior of British New Guinea.

Mr. E. C. BEDWELL exhibited the following species of Coleoptera taken by him in North Wales (on Snowdon) in the first week of August 1903—a fine series of *Chrysomela cerealis*, L., a pair of them being of the curious dull form, *Anthophagus alpinus*, Payk., *Acidota crenata*, F., *Arpedium brachypterum*,

Grav., and *Quedius longicornis*, Kr., the latter taken from moss on a stump in the wood at the foot of Snowdon, close to the Llanberis Falls. There appears to be no previous record of this species occurring in Wales.

The Rev. F. D. Morice exhibited a series of lantern slides illustrating the structure of concealed ventral segments in males of the Hymenopterous genus *Colletes*.

Mr. W. J. Kaye exhibited a Mullerian association of black and transparent species from the Potaro Road, British Guiana, consisting of *Ithomiinæ*, *Ithomia zarepha*, *Ithomia florula*, *Heterosais sylphis*, and *Napeogenes* n. sp.; *Erycinidæ*, *Stalachtis phædusa*, and *Stalachtis evelina*; *Hypsidæ*, *Lauron partita*; *Geometridæ*, *Hyrmina*, n. sp. The whole of the specimens had been caught on one single forest road, some 170 miles inland. Mr. Kaye called particular attention to the new species of *Napeogenes*, and said it was a most remarkable divergence from the usual coloration of the genus Napeogenes as a whole, where brown, yellow and black were the prevailing colours, while the present insect was black and transparent only, and conformed in a wonderful way with many true members of the genus *Ithomia*. Attention was further drawn to the fact that typically coloured *Napeogenes*, *N. inachia* and *N. iphianassa*, occurred not uncommonly on the same ground and fell into another group of similarly coloured species. It was thus not a little remarkable that, with these two different forces acting, such a complete transference could have been effected on the present undescribed species, and it went to show what a powerful influence these black and transparent species exert even in the presence of counteracting forces.

The President exhibited a male and female of *Papilio dardanus*, captured *in coitu* by Mr. Geo. F. Leigh, at Durban in 1902, and examples of the offspring reared from the eggs laid by the female. The latter was of the *cenea* form, as were the great majority of the female offspring; three, however, were of the black and white *hippocoon* form. More recently, in 1903, Mr. Leigh had captured a female of the rare *trophonius* form, and had bred from the seven eggs laid by it five butterflies, of which the two females were both

of the commonest *cenea* form. The female *trophonius* was also exhibited together with the five offspring.

Capt. C. E. Williams, I.M.S., introduced by Dr. D. Sharp, F.R.S., exhibited a living *Gongylus gongyloides* ♀ in the nymph stage, together with coloured drawings, photographs, and lantern slides showing both the adult and immature insect in various positions. The chief features of interest in the exhibitions lay in the peculiar modifications of shape and colouring by which this Mantis conceals itself and attacks its prey, which consists of Lepidoptera and Diptera. The insect adopts an inverted position, turning its ventral surface to the sunlight. The floral simulation is effected by the shape and colouring of the prothorax. This is greatly elongated so as to form a stalk, which is coloured greenish-brown; in front of this elongation the prothorax is expanded into a somewhat diamond-shaped plate or disc, around the insertion of the front pair of limbs. This disc is coloured a bright blue or violet on its ventral aspect with a centrally situated spot of deep black pigment, and with the stalk assumes a striking resemblance to a small blue flower, this deception being enhanced by the manner in which the insect swings itself to and fro, as if to imitate a blossom quivering in the breeze. The front or raptorial limbs are armed with formidable spines, and when at rest are held folded in front of the disc, ready to seize any insect which approaches. Both male and female insects have the same general conformation and colouring. The female, however, in the imago stage has imperfectly developed wings, and cannot use them for flight, while the male has these organs well formed and is capable of powerful flight. The antennæ of the adult male are large and bi-pectinate, while those of the female are filiform and inconspicuous. The Mantis exhibited was the sole survivor of twenty-one brought to England in June 1903 from Rangoon. It was hatched during January, and had passed through eleven ecdyses, but failed to effect the last change to the imago stage in October 1903.

Notices.

The President, at the suggestion of Mr. A. J. Chitty,

invited exhibitions at the next meeting of the genus *Tropiphorus*. He also invited Fellows to join in a discussion at the next meeting upon "What is a species?"

Papers.

Mr. G. A. J. Rothney communicated "Descriptions of new species of *Cryptinæ* from the Khasia Hills, Assam, and a new species of *Bembex*," by Peter Cameron.

Mr. Malcolm Burr contributed "Systematic Observations upon the Dermatoptera."

Dr. T. A. Chapman read a paper "On a new species of *Heterogynis*," and exhibited specimens of this and other allied species from Digne, Moncayo, Spain, and other localities.

Mr. Roland Trimen, F.R.S., read a paper "On some new or imperfectly known forms of South African butterflies," and exhibited among other specimens, illustrating his remarks, typical and aberrational forms of *Acræa rahira*, *Zeritis felthami*, a new species, *Z. molomo*, Trim., and *Z. damarensis*, Trim.; typical *Colias electra*, Linn., from Natal, and a remarkable melanic aberration of the same species; also *Kedestes tucusa*, a very rare and unfigured Hesperiid ♀ and ♂ from Johannesburg.

Capt. C. E. Williams, M.A., M.B., I.M.S., read a paper entitled "Notes on the Life History and Habits of *Gongylus gongyloides*, a Mantis of the tribe Empusides, and a Floral Simulator."

Wednesday, March 2nd, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of a Fellow.

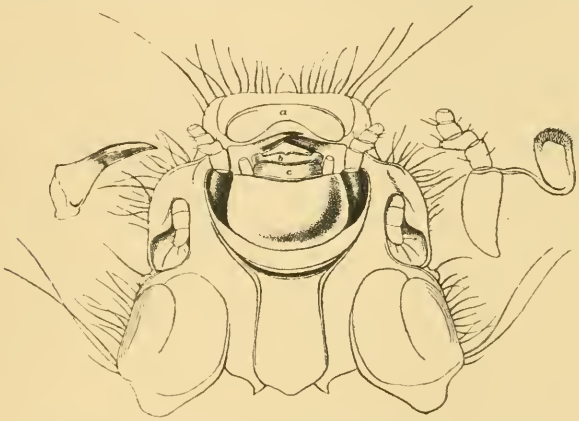
Mr. L. C. H. Young, of 1, Rampart Row, Bombay, was elected a Fellow of the Society.

Exhibitions.

Commander J. J. Walker, R.N., exhibited (1) *Hecatesia fenestrata*, Bdv., an interesting Australian moth, the ♂

possessed of a very marked power of stridulation (stridulating organ on longitudinal transparent bar on fore-wing), known in New South Wales as the "Whistling Moth"; (2) *Dodonidia helmsi*, Butler, a rare Satyrid butterfly from New Zealand, and (3) a gigantic species of the *Thysanurid* genus *Japyx*, found at Picton, New Zealand.

Mr. C. O. Waterhouse exhibited a diagram of the mouth of one of the Mallophaga (*Læmobothrium titan*). He said that in 1885 Dr. Grosse (Zeits. Wiss. Zool., 35, p. 537) propounded the theory that the palpi at the side of the mouth



Under-side of the head of *Læmobothrium* with the left mandible and maxilla more enlarged.

a, Labrum. *b*, Hypopharynx. *c*, Labium.

were not maxillary, but labial, and that the single joints considered by some authors to be labial palpi were the paraglossæ. Dr. Grosse moreover figures what he considered to be the true maxillæ as somewhat ovate lobes lying in the mouth cavity, unconnected with the large lateral palpi. Mr. Snodgrass in the "Occasional papers of the Californian Academy of Sciences" (vi, 1899, p. 149) has given similar figures.

Both these and other authors have overlooked the fact that these lobes are connected by a narrow chitinous strip with the lateral palpi, and are in fact the laciniæ, curiously bent it is true, but presenting no morphological difficulty.

The stipes is probably represented by a chitinized plate, just below the palpus, on each side of the membranous submentum. These larger palpi are therefore certainly maxillary palpi. The labial palpi consist of a single joint, which agrees in its structure and in the white membranous apex with apical joint of the maxillary palpi.

Mr. G. C. Champion exhibited specimens of two species of *Dorcadion* found during his recent journey in Spain; *D. almarzense*, Esc.?, from the summit of Moncayo, and *D. neilense*, Esc., from the Sierra de Logroño. He also exhibited numerous examples of *Pyropsyche moncaunella*, Chapm., found by Dr. Chapman and himself on Moncayo.

Mr. A. J. Chitty, Mr. F. B. Jennings and other Fellows exhibited specimens of the genus *Tropiphorus*. Mr. Chitty pointed out that the exhibition seemed to show that *T. tomentosus* and *T. obtusus* were in reality one and the same species. He had taken them together at Forres; Dr. Sharp had taken them both at Dumfries, and the Cumberland collectors had also taken both forms together. Apparently *obtusus* had not been found apart from *tomentosus* in the United Kingdom. Mr. H. St. J. Donisthorpe said that he had taken the two together at Rannoch, Commander J. J. Walker possessed both forms from Belfast taken together, and Mr. Jennings mentioned a similar coincidence in Wales. Mr. Chitty thought that there might be genuine distinct *Tropiphorus obtusus* on the Continent, but further physiological evidence was necessary before any definite conclusion on the subject could be obtained.

The President exhibited a specimen of *Glenea pulchella* (Thoms.), one of three individuals of the species taken on June 25th of last year, near "Barwood," in the Ouchterlong Valley, in the Nilgiris, by Mr. Leslie Andrewes. In a letter dated June 26th, 1903, not written with a view to publication, Mr. Andrewes described the circumstances of their capture: "The most striking [of the beetles] is a parti-coloured Longicorn about $1\frac{1}{4}$ inches long, which clearly mimics a large Ichneumon fly, which I have yet to discover. I have three of the beetles. The first two I was just going to grab as they settled, and each time I said to Downing, '. . . I'm

glad I didn't catch that beastly fly: he looks like a stinger,' when something made me look again, and I saw what it was. It is curious my making the same mistake twice. It is a most elegant case of mimicry; yet when the beetle is in the hand, it seems impossible to take it for anything but what it is. When it settles it curves the ends of its antennæ out and keeps them quivering just like an Ichneumon. There is a metallic sheen on the elytra just as you get on dark-winged flies, and the white spots on them seem to suggest an annulated body underneath the wings; yet the resemblance is not in the details of the markings, but in the whole appearance of the insect."

The PRESIDENT remarked that the appearance of the beetles entirely justified Mr. Andrewes' statement. No one, looking at the specimens in the cabinet, could imagine that during life they would suggest so strongly the appearance of a Hymenopterous insect. The allied species *G. iresine* (Pascoe), from Borneo, was described by Mr. R. W. C. Shelford, M.A., as a good mimic, and in this case the resemblance is tolerably obvious even in the dead specimen. Mr. Shelford says of it: "The middle third of the elytra is brown, shading anteriorly into blue, posteriorly into greyish-white; the model is a small blue *Hylotoma*, and when the wings are laid back the resemblance between the two species is striking; the blue anterior third of the beetle's elytra corresponds to the posterior part of the *Hylotoma's* thorax, the brown portion to the abdomen with the superposed wings, the greyish posterior third to the tips of the wings of the model, which project beyond the end of the abdomen." (Proc. Zool. Soc., 1902, vol. ii, p. 240.) When the whole genus *Glenea* is examined, the marked conspicuousness of some of the species suggests that the mimetic resemblance displayed by others is Müllerian or Synaposematic, rather than Batesian or Pseudaposematic. The essential importance of a study of the living insect in its normal environment, for the true interpretation of many examples of mimicry, could hardly receive a better illustration than by Mr. Andrewes' specimen accompanied by the notes upon it. Many years ago (in 1889) the speaker had shown a painting of the common English beetle, *Clytus arietis*, to Dr.

Alfred R. Wallace, and suggested that it was a good example of mimetic resemblance to a wasp. Dr. Wallace was at first inclined to doubt this interpretation, but when asked whether he had ever seen the beetle move he recalled the habits of the allied Oriental species and at once admitted the resemblance. The movements of the English species were described by the President in 1890 ("Colours of Animals," p. 250): "The slender wasp-like legs are moved in a rapid somewhat jerky manner, very different from the usual stolid Coleopterous stride, but remarkably like the active movements of a wasp, which always seem to imply the perfection of training."

Mr. L. B. Prout exhibited, on behalf of Mr. A. Bacot, long-bred series of *Triphæna comes*, Hb., the result of breeding for two generations from a wild ♀ of the *curtisii* form, taken near Forres. In the first generation, rather more than half the progeny followed, to a certain extent, the parent ♀, though varying from rich deep red to almost black. Pairings of these dark specimens resulted in a brood in which the percentage of ab. *curtisii* was slightly increased, although the type forms were still well represented; but it was noticeable that in every specimen the orbicular stigma was filled up with the darker or melanic colour.

Papers.

Mr. Arthur M. Lea communicated "Notes on Australian and Tasmanian Cryptocephalides, with descriptions of New Species."

Mr. Gilbert J. Arrow communicated "A Revision of the subfamily *Pelidnotinæ* of the Coleopterous family *Rutelidæ*, with descriptions of New Genera and Species," by the late Frederick Bates.

Colonel Charles Swinhoe, M.A., F.L.S., read a paper "On some new species of Eastern Australian and African Moths in the British Museum."

Mr. George Charles Champion, F.Z.S., read a paper on "An Entomological Excursion to Moncayo, Spain, with Some Remarks on the Habits of *Xyleborus dispar*, Fabr., by Dr. Thomas Algernon Chapman, M.D."

Mr. Kenneth J. Morton communicated "Further Notes

on *Hydroptilidæ* belonging to the European Fauna, with descriptions of New Species," and

Mr. R. W. C. Shelford, M.A., communicated "A Note on *Elymnias borneensis*, Wallace."

Dr. F. A. Dixey read the following communication:

In the late Professor Westwood's "Introduction to the Modern Classification of Insects," vol. ii, 1840, p. 352, under the head of Heliconidæ, there occurs the following passage: "A curious circumstance has been recently published relative to one of the species, *Euplœa* (*Danais*) *hamata*, MacLeay, an inhabitant of New Holland, where it abounds to such an extent, that it is employed as an article of food by the natives, who call them Bugong, and collect them by bushels, and then bake them by placing them upon heated ground." References are given by Westwood to Bennett's "Wanderings in New South Wales," and to Kirby's Bridgewater Treatise.

Thinking that the existence of a *Euplœa* (or, as it would now be called, a *Tirumala*) used as human food was a matter of considerable interest, I looked up the passage in Bennett's "Wanderings." It is as follows:

"The Bugong moths . . . collect on the surfaces and also in the crevices of the masses of granite in incredible quantities: to procure them with greater facility, the natives make smothered fires underneath those rocks about which they are collected, and suffocate them with smoke, at the same time sweeping them off frequently in bushels-full at a time. After they have collected a large quantity, they proceed to prepare them, which is done in the following manner. A circular space is cleared upon the ground, of a size proportioned to the number of insects to be prepared; on it a fire is lighted and kept burning until the ground is considered to be sufficiently heated, when, the fire being removed, and the ashes cleared away, the moths are placed upon the heated ground, and stirred about until the down and wings are removed from them; they are then placed on pieces of bark, and *winnowed* to separate the dust and wings mixed with the bodies: they are then eaten, or placed in a wooden vessel called a 'Walbun,' or 'Culibun,' and pounded by a piece of wood into masses or cakes resembling lumps of fat,

and may be compared in colour and consistence to dough made from smutty wheat mixed with fat. The bodies of the moths are large, and filled with a yellowish oil, resembling in taste a sweet nut. These masses . . . will not keep above a week, and seldom even for that time; but by smoking they are able to preserve them for a much longer period. The first time this diet is used by the native tribes, violent vomiting and other debilitating effects are produced; but after a few days they become accustomed to its use, and then thrive and fatten exceedingly upon it." ("Wanderings in New South Wales," by George Bennett. London, 1834. Vol. i, p. 270.) Mr. Bennett adds that "it is not only the native blacks that resort to the 'Bugong,' but crows also congregate for the same purpose." (*Ibid.*, p. 272.)

The foregoing extract contains several points of interest. In the first place the statement that the flavour of the insects resembles that of a sweet nut recalls the experience of Plateau with *Abraxas grossulariata*, and that of Wheeler and Marshall with various insects believed on good grounds to be objectionable to insect-eating animals. (See Prof. Poulton in Trans. Entom. Soc. Lond., 1902, pp. 405–414.) Again, the assertion as to the deleterious effects of the Bugong diet is of interest in relation to Prof. Poulton's suggestion regarding the rejection of *Acræas* by the *Mantidæ*, as being ultimately due to their unwholesome character. (*Ibid.*, pp. 318, 319.)

It will be observed that Mr. Bennett persistently speaks of the Bugong as a moth, whereas Prof. Westwood states categorically that it is a butterfly belonging to the genus *Euplœa*. The description of the insects "collecting in the crevices of the masses of granite in incredible quantities" seemed to me so unlike what was to be expected of a true *Euplœa*, that I could not help suspecting a mistake of some kind. Searching in Mr. Bennett's book for further information about the insect in question, I found the following description: "The largest specimen I obtained measured seven-eighths of an inch with the wings closed, the length of the oily body being five-eighths of an inch, and of proportionate circumference; the expanded wings measured one inch and three-quarters across; the colour of the wings dark

brown, with two black ocellated spots upon the upper ones; the body filled with yellow oil, and covered with down." . . . "On showing them [the Murrumbidgee natives] the few insects I had, they recognized them instantly; but I thought there was a feeling of disappointment at their curiosity only, not appetites, being gratified by my little entomological collection." (*Loc. cit.*, p. 274.)

It seems evident from this that Mr. Bennett is right in calling the Bugong a moth, and that it is at any rate certainly not a *Euplœa*. This fact robs the observation of some of its significance; nevertheless it seemed to be worth while to find out if possible the origin of the mistake. The explanation proved to be a simple one, but it affords so good an example of the way in which errors are propagated from book to book, that I think I may venture, without wearying my audience, to give a brief sketch of the history of this curious misapprehension.

On an earlier page of the "Wanderings," Mr. Bennett had been commenting on the gregarious habit of the Bugong, the purpose of which, he says, our present knowledge is insufficient to determine. To this passage he appends a footnote, which runs thus: "Captain Cook mentions, that at Thirsty Sound, on the coast of New South Wales, he found an incredible number of butterflies; so that, for the space of three or four acres, the air was so crowded with them, that millions were to be seen in every direction, at the same time that every branch and twig was covered with others that were not upon the wing; and Captain King observes ('Survey of the Coast of Australia,' vol. i, p. 195): 'Here, (Cape Cleveland,) as well as at every other place that we had landed upon within the tropic, the air is "crowded" with a species of butterfly, a great many of which were taken. It is, doubtless, the same species as that which Captain Cook remarks as so plentiful in Thirsty Sound. The numbers seen by us were indeed incredible; the stem of every grass tree, (Xanthorrhœa,) which plant grows abundantly upon the hills, was covered with them; and on their taking wing, the air appeared, as it were, in perfect motion. It is a new species; and is described by my friend, Mr. W. S. MacLeay, under

the name of *Euplœa hamata.*'" ("Wanderings," vol. i, p. 269.)

I have verified the quotation in King's "Survey," which was published in London in 1827. Cape Cleveland is in the present Colony of Queensland. In King's time it was in New South Wales, as shown in his map. MacLeay's description is in King's second volume, Appendix, p. 461. In the course of it he says, "This insect comes so very near to the *Euplœa limniace* of Godart and Cramer, which is common on the Coromandel Coast as well as in Java and Ceylon, that I can scarcely consider it as anything but a variety of that species."

From this it is clear that Captain King conjectures his *Euplœa* (i. e. *Tirumala*) to be the same species as that observed by Captain Cook, which may or may not be correct. Mr. Bennett, however, merely adduces their accounts as illustrations of the gregarious habit among lepidoptera, and in no sense attempts to identify these butterflies with his Bugong. But in the year following the publication of the "Wanderings," Mr. Kirby brought out his Bridgewater Treatise. In it he took occasion to reproduce from Mr. Bennett's book the account you have just heard, adding that "millions of these animals were observed also, on the coast of New Holland, both by Captains Cook and King." (Kirby, Bridgewater Treatise, London, 1835, vol. ii, p. 351.) Referring also to the Bugong, he speaks of "these moths, or rather butterflies," and appends a note giving their name as *Euplœa hamata*, MacLeay.

The original mistake was therefore the late Mr. Kirby's. He had evidently read Mr. Bennett's narrative, and the footnote giving the experiences of Captains Cook and King. From this he jumped to the conclusion that all three observers were speaking of the same insect—a conclusion from which a slightly more extended study of Mr. Bennett's work would have saved him. But having fallen into this error, he unfortunately carried Prof. Westwood with him, and one or other of these authorities is probably responsible for the appearance of the same mistake in at least one work of popular natural history, where indeed it first attracted my attention.

The observation remains an interesting one, and I have thought it worth while, even at some risk of being tedious, to try to clear up the misapprehension that has surrounded it.

Note.—Sir George Hampson has kindly informed me that the true Bugong is probably *Euxoa infusa*, Boisd., one or two of the common allied species being very likely included under the same native name. *E. porphyricollis*, Guen., seems to suit Mr. Bennett's description fairly well. (See Sir G. Hampson's "Catalogue of the Lepidoptera Phalænæ in the British Museum," vol. iv, 1903, p. 165.)

Commander J. J. Walker said the moth was an Agrotid (*Agrotis spina*) generally distributed over New South Wales and Victoria. It was perfectly true that the natives collected those insects for food. 1900 was a good *Bugon* year, but last November very few were met with. As to the nutritive qualities of the species, he said that the deck of H.M.S. "Ringarooma" in which he was at the time serving was much stained with oleaginous matter from crushed specimens which came aboard in great numbers.

Mr. C. O. Waterhouse said the specimens in the British Museum rather resembled *Mamestra brassicæ*.

Discussion.

The Rev. F. D. Morice opened the discussion upon "What is a species?" He said that he had originally chosen this subject without knowing that it would be dealt with in the Presidential Address. That Address made it needless to touch on many points which must otherwise have been raised.

He did not think that the word "Species" need be or had better be dropped because we had generally abandoned the Linnean conception of a species. In all branches of science old words come to be used in new senses as knowledge advances and errors are exploded. We need not be too timid about the ghosts of old meanings. Astronomers still talk of "planets"; J. S. Mill re-defined Genera and Species in logic; and zoologists may claim a similar liberty.

The speaker thought that he personally meant by "a species" something like this—a group (the largest he could bring together) of forms so similar as to suggest descent from

one ancestral pair of which they had retained practically all the heritable qualities: *i.e.* they differed only in such respects as we have reason to think either (*a*) individual and not phyletic (*aberrations, monstrosities*), or (*b*) phyletic but quite trifling in comparison with the conformity in other points (*races, sub-species*), or (*c*) resulting from a potential variability which was itself part of the original inheritance (*dimorphism, special adaptations*, etc.). He believed that "syngamy" would practically always characterize such a group, but that it was not the character which he himself had most in mind when considering whether a group was or was not a species. Nor did he think the absence of links with other groups essential to the definition.

Species seemed to him real but not permanent or ultimate phenomena in nature. At any time a transverse section through the "Tree of Life" (Darwin) would show us forms arranged at actual differing distances from one another, but no two such sections taken at different epochs would give the same result. What is now a species will one day be represented by a genus, or it may have passed out of existence altogether. The *Systema Naturæ* seems to conceive Science as mapping out and measuring a stationary field, we have come rather to regard her as having to deal with a flowing river.

Dr. F. A. Dixey said that though it was easy to define a "species" in the logical sense, the zoological conception of the term was surrounded by great difficulties. Darwin had explained what he meant by a species in contradistinction to a variety; but, as Professor Poulton pointed out in his Presidential Address, when asked for a definition by Phillips, Darwin had admitted his inability to give one. It was necessary to have a working unit for purposes of classification. Linnæus had supplied such a unit which had served its purpose for a time, but like other attempts it had eventually been found wanting in correspondence with the facts of nature. The present state of fluidity, however, was more hopeful than the old confusion out of which the Linnæan conception emerged. It implied a recognition of the fact that hard-and-fast lines were not easily found in nature. Here and there an isolated assemblage of individuals could be named, round

which it would be possible to draw a definite line; but in many cases the delimitation of frontier must be arbitrary. The President had brought forward a striking instance in the case of *Amauris niavius* and *A. dominicanus*, which had been shown by Mr. Neave to be connected in the Uganda district by a complete series of intermediate forms. Still more striking perhaps was the case of *Mylothris chloris* and *M. agathina*, which had always been considered as completely distinct as any two species in the genus, but which intergraded with one another in the same district of Uganda. In the genus *Colias* again, the speaker, after a careful study of Mr. Elwes' well-known papers, found himself in complete agreement with the opinions there expressed as to the impossibility of separating various forms that had received distinct specific names. "Typical" forms, for instance, of *C. palæno* and *C. chrysotheme* in the Old World, and of *C. philodice* and *C. eurytheme* in the New, were sufficiently dissimilar; yet in certain parts of their area of distribution, these forms seemed to be inextricably interconnected.

It appeared to be now admitted by many naturalists that the question, "What is a species?" resolved itself into a matter of general convenience. What then, from this point of view, were the best criteria of specific distinctness? The President in his recent Address had suggested more than one such test. Of these the most crucial was probably epigony. It met such cases as those of seasonal dimorphism, where the syngamic test was inapplicable; moreover it had the advantage of getting rid altogether of the arbitrary element. Evidence as to syngamy was extremely valuable, and in most cases was more easily obtained; but it could hardly be said that syngamy used as a test of specific distinction was able to dispense with the personal equation. Syngamy was controlled by sexual preference; of this many degrees were known to exist. On the one hand there was perfectly free interbreeding, on the other the "rare and occasional interbreeding" which, as Prof. Poulton said, "is not syngamy." Somewhere among the intermediate stages the line must be drawn, and when drawn it would still be arbitrary.

On the question of sterility of first crosses and of hybrids,

the President's criticism of the Knight-Darwin law seemed well-founded. Just as mutual fertility might be favoured under selection, so no doubt it might be diminished or abolished under isolation, by which selection is precluded. Sterility in such cases was thus rather a consequence than a cause. There must, however, be some reason for the numerous contrivances which existed to ensure cross-fertilization.

Mr. A. J. Chitty thought there were really two questions involved in the discussion. (1) Did there exist in nature anything corresponding to the one idea of species? (2) What was the point at which living things ought to be considered as distinct for the purposes of nomenclature and the arrangement of collections? In practice it was necessary to take some point, but if the history of life on the world was represented by a tree as explained by Mr. Morice, he doubted whether the idea of "species" had any counterpart in nature. The distinctions between animals would vary to an almost infinite extent, and would depend on the number of intermediate forms which had fallen out, and he doubted whether there was any precise point at which the distinctions became different in kind. For study and collecting purposes some such point must be chosen, but he was not prepared to lay down a rule where it should be placed. Where a large number of intermediate forms had fallen out you found a distinction which was what he understood was generally intended by the term "specific distinction." Where this was not so you got races and sub-species, and it was impossible that a collection should represent the actual state of things in nature.

Mr. H. J. Elwes, Mr. W. E. Sharp, Dr. T. A. Chapman, and other Fellows continued the discussion, and the President said that he did not think that he ought to speak on the subject after the amount of their time which he had occupied on the occasion of the Anniversary Address. He would like, however, to remark that he had never conceived of the origin of a species "from one ancestral pair," but always from the change of masses rather than of individuals. He heartily agreed with Mr. Morice in regarding a genus as formed by the further differentiation of a single species, but it appeared to him that it was the splitting of the single community into separate

sub-communities which was the foundation of the process. He quite agreed with Dr. Dixey that epigony was far superior to syngamy as a test of species, but he was considerably influenced by the much greater ease with which the latter evidence could be obtained in quantity. For one synepigonic family bred, the records of probably many hundred examples of pairing could be preserved. The former evidence is indeed hardly available at all for the travelling naturalist, while its collection on a large scale demanded the existence of the much-needed zoological station. Although, as Dr. Dixey had said, many degrees of syngamy were known to exist, it is improbable that the intermediate grades are sufficiently common to obscure the test, except in isolated cases. In conclusion the PRESIDENT said he had found much comfort in the reflection that after all the inter-breeding community is an objective fact, however difficult it may be to prove in any particular case, and that if this be accepted as a criterion of species it will be one in which the subjective element is reduced to a minimum.

Will of the late Herbert Spencer.

Mr. H. ROWLAND-BROWN, one of the Secretaries, read the following extract from the Will of the late Herbert Spencer, dated 19th January 1900, as showing the benefits derived or to be derived by the Society thereunder :—

"7. I give to my Trustees the copyrights English stereotype plates and English stock of the Autobiography and of all my other books namely 'Descriptive Sociology Parts 1, 2, 3, 4, 5, 6, 7 and 8' 'First Principles' 'The Principles of Biology' 'Principles of Psychology' 'Principles of Sociology' 'Principles of Ethics' 'Education' 'Social Statics' Three volumes of 'Essays' 'The Study of Sociology' 'The Man versus the State' 'Various Fragments' together with those of my smaller publications 'The Inadequacy of Natural Selection' 'A Rejoinder to Professor Weismann' and of my Father's two works 'Inventional Geometry' and 'Lucid Shorthand' And also my interest in those Editions of the 'Study of Sociology' published by Messrs. Kegan Paul

Trench & Co. And I also give and bequeath to my Trustees my American Stereotype plates and any interests not otherwise disposed of which I may have in the American Editions of my works and also my interest in the French German and Italian Translations of the 'Study of Sociology' and the 'Principles of Sociology' and the French translations of the 'Data of Ethics' of 'Justice' and of other Works and also the English and American Copyrights English Stereotype plates and English stock respectively of any other Works of mine wholly or partially executed at the time of my death And also all I may possess in stocks shares bonds and other investments And all the residue of my personal estate wheresoever situate including the subject matters of such legacies or legacy as may lapse owing to the legatees or legatee predeceasing me Upon trust to continue the publication and sale of each of the beforementioned Works so long as it shall yield a profit And upon trust as to such part of my residuary personal estate as shall consist of stocks funds shares or securities either to allow the same or any part thereof to remain in the state of investment in which it may be at the time of my death or to convert and get in the same or any part thereof as well as the residue of my estate not hereby disposed of and to invest the net proceeds arising from such conversion in the names of my Trustees in the debenture preference or guaranteed stocks or shares of any Railway Company in Great Britain which at the time of the investment shall have paid a dividend on its ordinary stocks or shares for the last half year prior to the date of investment with power at their discretion from time to time to vary such investments into or for others of the kinds prescribed And I declare that my Trustees shall apply as nearly as possible the whole of the income derived from all investments for the time being representing my residuary estate And also the income derived by my estate from the publication and sale of the Works mentioned in this my Will (including the Autobiography and Biography) in resuming and continuing during such period as may be needed for fulfilling my expressed wishes but not exceeding the lifetime of all the descendants of Queen Victoria who shall be living at my decease and of the survivors or

survivor of them and for twenty-one years after the death of such survivor the publication of the existing parts of my 'Descriptive Sociology' and the compilation and publication of fresh parts thereof upon the plan followed in the parts already published And I desire that my Trustees shall be guided by a series of memoranda for their instruction dated the 14th day of August 1899 and signed by me specifying the work to be executed naming the various peoples and nations of which accounts are to be given in the manner prescribed and describing a reorganization of the whole series of works already executed to be executed which shall be eventually undertaken.

"And I direct that the net receipts from such publication as above described shall be applied in the same manner as the income of my residuary estate And I expressly empower my Trustees to delegate to some competent person the duty of selecting and appointing (subject to their approval) competent compilers deciding (subject to their approval) upon successive works to be undertaken by them overseeing the execution of such works superintending their publication and deciding (subject to their approval) upon the remuneration of such compilers and rendering periodical reports and accounts to my Trustees and out of such annual income my Trustees shall appropriate and pay to the person so delegated One hundred and fifty pounds per annum or such larger sum as having regard to the work to be done they may think reasonable and proper And I wish that the first person so appointed shall be Henry Tedder Secretary and Librarian to the Athenæum Club And I further direct that the appointment of any such person as aforesaid may be revoked at pleasure by my Trustees.

"8. When the series of works and the recognized work specified above shall have been completely executed and published my Trustees shall thereupon sell by auction the copyrights stereotype plates and stock of the whole body of them and shall sell in like manner the copyright stereotype plates and stock of such of my works if any as continue to be published by them and shall sell in the usual way the shares stocks funds securities and other property held by them as Trustees

And shall give the sum realized in equal parts to the Geological Society the Geographical Society the Linnæan Society the Anthropological Institute the Zoological Society the Entomological Society the Astronomical Society the Mathematical Society the Physical Society the Chemical Society and the Royal Institution and the British Association or such of them as shall then be in existence and shall accept the gift upon the condition in each case that the sum received shall within five years from the date of payment be spent by the Governing Body for the purchase or enlargement of premises or for books or apparatus or collections or for furniture or repairs or for equipment of travellers and donation of instruments of research but in no way or degree for purposes of endowment And after having previously made an authorized statement of the purposes for which the donation is to be used the receipt or acknowledgment by the Treasurer or Secretary of the Society to or for the benefit of which the payment is made to be in each case an absolute discharge to my Trustees And a certificate in writing signed by all my Trustees stating that they have carried out the provisions of the trust to the best of their judgment and ability shall be complete termination of their responsibilities and shall be conclusive and binding on all persons and institutions interested under this my Will."

Wednesday, March 16th, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Miss M. Maude Alderson, of Park House, Worksop, Notts; the Hon. Richard Orlando Beaconsfield Bridgeman, R.N., of Weston Park, Shifnal, Salop, and H.M.S. "Clio," Australian Station; Mr. W. A. Luff, of La Chaumière, Brock Road, Guernsey; Mr. Frank S. Mumford, of 10, Mountfield Gardens, Tunbridge Wells; Mr. Edward Harris, of 2, Chardmore Road, Upper Clapton, N.E.; Mr. Thomas Frederick Furnival, of Honduras Cottage, Bushey Heath, and Clovelea, Bishopstone,

Sussex ; and Mr. Geoffrey Meade-Waldo, of Stonewall Park, Edenbridge, Kent, and Magdalen College, Oxford, were elected Fellows of the Society.

Exhibitions.

Mr. G. T. Porritt exhibited a pair of *Æschna isosceles*, taken by him with others of the same species in the Norfolk Broads last summer. The species had been regarded as almost lost to the British list for many years. Mr. W. J. Lucas said the dark corner of the hind-wings helped to distinguish it from *A. grandis*, as well as the isosceles triangle on the second segment of the abdomen.

Mr. J. E. Collin exhibited (1) *Phora formicarum*, Verr., which is parasitic on the ant *Lasius niger*, obtained by sweeping the herbage in a paddock at Newmarket. In his book, "Ants, Bees and Wasps," Lord Avebury said of this species, "If the nest of the brown ants is disturbed at any time during the summer, some small flies may probably be seen hovering over the nest, and every now and then making a dash at some particular ant. These flies belong to the genus *Phora*, and to a species hitherto unnamed, which Mr. Verrall has been good enough to describe for me (see Appendix). They lay their eggs on the ants, inside which the larvæ live. Other species of the genus are in the same way parasitic on bees." Prof. Westwood as long ago as 1840 (Intro. Mod. Classification Ins.) recorded having "repeatedly observed on disturbing the nest of the common brown garden ant a very minute species of *Phora* hovering over and flying upon the ants." This species has not been found or recognized by Continental Dipterologists. (2) *Phora* sp. found in a garden at Newmarket, running about at the entrance (which looked like that of a mouse's hole) to the nest of a species of *Bombus*. Specimens received from Dr. Sharp labelled "from Bombus nests," are also the same species. It is evident that its life history is in some way connected with that of the Bombus, but because of the different shape and form of the female ovipositor, it is probably not parasitic on the bee like *P. formicarum* is on the ant, but acts as a scavenger, by living on the dead pupæ in the nest.

Commander J. J. Walker exhibited: (1) A series of *Buprestidæ*

from Sydney, N.S.W., and the adjoining district (including the nearest part of the Blue Mountains), comprising about 120 species, of which 70 belonged to the genus *Stigmodera*. Also a dried specimen of *Angophora cordifolia*, Cav., a small tree of the natural order *Myrtaceæ*, the flowers of which are the great attraction in New South Wales for the *Buprestidæ*, as well as for very many other Coleoptera. (2) Specimens of the "Bugong" Moth, *Agrotis spina*, Guenée, from Jervis Bay, N.S.W. (referred to at the previous meeting); and (3) *Carthæa saturnoides*, Walk., a remarkable moth from Perth, W.A., now referred to the *Geometrina*, but possessing an extraordinary superficial resemblance to a *Saturniid* in aspect, though not to any one of the known Australian species of that family.

Colonel C. Swinhoe said the moth was a Monocteniid; and there was nothing in Australia which it could mimic.

Mr. A. J. Chitty exhibited a specimen of *Peribalus vernalis*, Wolff., a rare bug of which only five or six specimens appear to have been taken, and pointed out that as the records in Saunders Hemiptera included Cumberland and Weston-super-Mare, and his own specimen was taken at Huntingfield, Kent, it was probably overlooked. Mr. Claude Morley had also taken one specimen in Essex.

Dr. F. A. Dixey exhibited a remarkable pale form of *Mamestra brassicæ*, taken by Dr. G. B. Longstaff and himself at Morthoe, North Devon, on July 16, 1903. The specimen showed the usual markings of the species on a cream-coloured ground, faintly shot with pinkish or apricot. There was a slight smoky shade over the central area of the fore-wing, the hind-wings were yellowish-grey, the thorax yellowish-brown, the abdomen apricot-coloured with a dorsal chain of dark tufts. Mr. C. G. Barrett had examined the specimen, and pronounced it probably unique. Sir George Hampson had also seen it, and pointed out that it was provided with the spur on the anterior tibia, which is characteristic of *M. brassicæ* among the allied European species.

Papers, etc.

The President, Professor Poulton, read the following observations on the gregarious hibernation of certain

Californian insects, communicated to him by Professor Vernon L. Kellog, of the Leland Stanford Junior University, California.

"In reading in Marshall and Poulton, Trans. Ent. Soc. Lond. 1902, your references to gregariousness in hibernating and migrating insects, I was reminded of two conspicuous examples of gregarious hibernation which we observe here every winter. The Monarch Butterfly, *Anosia plexippus*, gathers each winter in thousands in a small forest of pine trees on Point Pinos peninsula on the Bay of Monterey. Sometimes these butterflies will gather in a single tree in great clusters and festoons; other winters they will not be quite so compactly massed, but will be spread over a few acres of forest. The *Asclepias*, the food-plant of this insect, does not grow, at least in any abundance, on this peninsula, but does grow on another promontory about fifty miles north, and there I have found the larvæ and pupæ in great numbers.

"You are aware that our winter here is very mild; there are bright warm days all through it, and these butterflies do not by any means remain immovable during their hibernation. Flowers are blossoming all through the winter in the little village on Point Pinos, and the butterflies may be seen fluttering about at these flowers on any bright day in the winter. Nevertheless this is true hibernation and conspicuously gregarious in character. This butterfly is one which Scudder and others have recorded as being migratory in the eastern States, moving in large flocks north and south with the varying seasons.

"The other case to which I refer is the gathering or 'sembling' of many thousands of the convergent lady-bird, *Hippodamia convergens*, on the ground under the fallen leaves in the deciduous forest of the low mountains near this University. We have taken as many as 40,000 of these beetles in a circular space of not more than ten feet radius. These beetles, when active, are found normally in the great orchards of the Santa Clara Valley, which lie at the foot of these mountains, feeding in the orchards on the scale insects and plant lice which are abundant there. But in winter the lady-birds leave the orchards, move up the mountain-side and hibernate as I have described. In

fact, we are not acquainted with the full life history of this insect, not knowing how many generations appear in the year, or whether the mating is accomplished in the fall before hibernation, or in the spring after hibernation, so one cannot be sure that the case substantiates your suggested theory of gregarious hibernation as a means for quick mating in the spring.

"A third familiar example of 'sembling' to be noted in California is the gathering in great numbers of the butterfly, *Pyrameis cardui*, repeatedly observed in Southern California near Claremont village."

The PRESIDENT then read a short paper bearing on the same subject, entitled "A possible explanation of insect swarms on mountain-tops." The speaker said that he had been led to make this communication in consequence of Mr. G. C. Champion's exhibit at the last meeting of *Dorcadion* from Spanish mountain-tops. These specimens and the description of *Coccinellidæ* on the summits revived the speaker's memories of his visit to the Sierra Guadarrama in July 1902, and of the hypothesis which had suggested itself as an explanation of the similar and kindred phenomena which had come under his observation. On an isolated mass of rock near the summit of Peñalara (about 7700 feet), behind La Granja (San Ildefonso), he had found, on July 25, 1902, *Coccinella 7-punctata* under every stone, *Dorcadion hispanicum* crawling about everywhere, and *Ammophila hirsuta* flying in a swarm. The latter it will be remembered was found by Fabre in hundreds under a flat stone on the summit of Mont Ventoux, on a cold rainy day. Fabre had suggested that the insects were perhaps migrating from one district to another, and had paused to rest on the mountain-top; but the observation on Peñalara threw new light on the interpretation; for these Fossors as well as the *Dorcadion* were in a state of great activity in the bright sun and were pairing freely. Furthermore, both were in fresh condition and had evidently only recently emerged from the pupal state.

It was suggested as probable that certain species of insects with powerful flight, after reaching the imaginal state, have the instinct to seek conspicuous isolated features in the

landscape, that in others with smaller powers or unable to fly the instinct is merely to ascend. The effect of both tendencies is to reduce the area over which the sexes have to find each other. A somewhat deferred maturity and the gradual collection of scattered individuals into swarms is probably associated with the instinct in many cases, facilitating still further the meeting of the sexes and the pairing of individuals from remote areas. It is obvious that the gathering swarm will be far more easily seen than single insects by the scattered individuals around. The swarming of beetles, etc., round tree-tops is probably to be thus explained. Related to the same combination of instincts preparatory to pairing is the driving off of the winged males and females by the workers of ant communities in response to some probably atmospheric stimulus which makes itself felt on a single day over a vast area. In the case of *Lasius niger* at El Escorial in July 1902, the President had observed the workers driving off the males and females in separate waves, thus rendering it more probable that each would mature in the presence of the opposite sex from other formicaria rather than from their own.

In the discussion which followed on the tendency of insects to seek high and exposed places, Dr. T. A. Chapman suggested that whereas it is necessary that hibernation should be as complete as possible, hill-tops and similar situations would be affected as places where the cold would be continuous. Commander Walker said he had climbed to the top of Croagh Patrick, a very isolated mountain in County Mayo about 2500 feet high early in the year, and found a number of Coleoptera there as well as *Calocampa vetusta* hibernating. Mr. Chitty drew attention to a paper on beetles recently published by the Director of the observatory on the summit of Ben Nevis, who attributed the presence of insects there to storms of wind. Mr. Champion said that in the case of *Dorcadion* sp. on Moncayo in North Spain which he found running about there on the tops, as they were wingless, this could not be the cause of their presence, while he had found ladybirds under the snow. Colonel Yerbury mentioned the case of the Warble Fly, which will always fly up to elevated ground to pair, so that the plan recommended by Miss Ormerod and other economic

entomologists of smearing the pastures with preventive mixtures was absurd, since the insect brings down its young with it, and does not breed in the low levels. Colonel Swinhoe supposed the swarming to be due to atmospheric conditions, and instanced the remarkable fact that all game will always fly up rather than down hill. Dr. Dixey had observed great quantities of butterflies on an exposed and conspicuous ridge which ran out from the cliffs at Morthoe, N. Devon, chiefly Satyrids and "Blues," while Mr. Rowland-Brown mentioned the many insects to be found at high alpine elevations, notably on the Besso (12,055 feet), near Zinal, where he had observed many small flies, and not far from the summit individuals of *Erebia glacialis*, attracted and drawn upward in his opinion by the warm upward currents of air from the valleys and lower slopes. Mr. Tutt supported the theory of insects seeking high and exposed localities for breeding purposes, and agreed with the view that hill-tops were the best places for assembling. Colonel Bingham, the Rev. F. D. Morice, Mr. Donisthorpe, and other Fellows joined in the discussion.

The President in reply thanked the Fellows for the many interesting facts which had been suggested bearing upon his hypothesis. With regard to *Dorcadion* he felt confident that the numbers on the conspicuous rock had not all been bred there, and that therefore there had been an instinct to crawl upwards from lower elevations. In this way, if the insects only came from a few hundred feet below, their chances of meeting each other had been multiplied thousandfold. He quite agreed with Dr. Chapman that hibernation may have played an important part in the instinct in the case of the *Coccinellidæ* but not in that of *Dorcadion*, the *Ammophila*, or the swarms of ants.

Mr. O. E. Janson contributed on behalf of Mr. F. P. Dodd, of Townsville, Queensland, a note upon "Maternal Instinct in Rhynchota."

Mr. H. Rowland-Brown read a "Note on *Oncoptera intricata*," a moth extremely destructive to pastures in Tasmania, by Mr. F. M. Littler, M.A.O.U., of Launceston, Tasmania, who sent also examples of the imago and larva for exhibition.

Describing the depredations on all sorts of grasses com-

mitted by the larvæ, he said that they did not feed on the root, but only on the stem and blades. The grass was thus killed by being eaten off continually level with the ground. In nearly every instance the tunnel is excavated close to the roots of a tuft of grass. The depth of a tunnel depends greatly on the nature of the soil. In light loamy soil they are found as deep as fifteen inches, but in heavy clayey land a few inches suffice. The average depth of a number in a permanent pasture was found to be ten inches. The tunnels are always driven at a slightly oblique angle; no particular quarter of the compass is, however, chosen. From the mouth of the tunnel a sort of covered way is constructed, often leading to a neighbouring tuft of grass. This covered way is formed of silk, covered with bits of grass and excrement, and is hardly ever more than six inches long. Usually there is only one to each burrow, but some of the burrows have as many as three covered passages leading to tufts of grass some four or six inches away. Of their natural enemies, the Bandicoots (*Perameles gunni* and *P. obesula*) do much good work in devouring numbers of larvæ. It is quite a common thing to find comparatively large areas of infested ground turned up by these little sharp-nosed animals in search of them. Several species of birds also assist their destruction, especially the Lesser White-backed Magpie (*Gymnorhina hyperleuca*). This bird feeds on the larvæ in the very early morning before they have retreated into their burrows, and the quantity devoured by this one species alone must be something enormous. A shining coppery black beetle (*Promocoderus ovicollis*), both in the imago and larval form, renders good service by destroying both moths and larvæ. A small red ant, very common in some districts, also gathers great numbers of the eggs and stores them in its nest. The eggs are kept until they hatch, when the young larvæ are devoured, the empty egg-shells being afterwards thrown out. As many as 1000 eggs have been found in one nest. In dry sandy soil Mr. Littler had also found numbers of larvæ, at various times, killed by a parasitic fungus, a species of *Cordyceps*.

Wednesday, April 20th, 1904.

Dr. F. A. Dixey, M.A., M.D., Vice-President, in the Chair.

Election of Fellows.

M. Jules Bourgeois, St. Marie-aux-Mines [Markirch], Germany; Mr. James E. Black, Nethercroft, Peebles, N.B.; Mr. Maurice Frederic Bliss, "Coningsburgh," Montpellier Road, Ealing, W.; Mr. Edward F. S. Tylecote, M.A., Durham House, Lansdowne Road, Bournemouth; Mr. Francis Gilliat, B.A., of Lloyds', E.C., and Forest Dene, Worth, Sussex, were elected Fellows of the Society.

Exhibitions.

Mr. M. Jacoby exhibited a ♂ specimen of the beetle *Sagra senegalensis* with ♀ characters received from Mr. Barker in Natal, who had taken it *in cop.*

Dr. Norman Joy exhibited *Orochares angustata*, Ev., taken at Bradfield, Berks, in December 1903—the second recorded British specimen; a species of *Tychius*, which he said might be a variety of *Tychius polylineatus*, Germ. (not now included in the British List), or, more probably, a new species closely allied to it, taken near Streatley, Berks, last year; and two specimens of *Pselaphus dresdensis*, Herbst., taken near Newbury this year.

Mr. C. O. Waterhouse exhibited an unnamed species of *Nemoptera* from Asia Minor, resembling *Nemoptera huttii* from Australia.

Papers.

Mr. F. Enock, F.L.S., read a paper on "Nature's Protection of Insect Life illustrated by Colour Photography," and exhibited a number of lantern slides.

Mr. P. I. Lathy, F.Z.S., communicated a paper on "New Species of South American Erycinidæ."

Discussion.

A discussion followed on specimens of the Dipterous families *Stratiomyidæ* to *Cyrtidæ*, opened by Mr. G. H. Verrall, who said that the object of the discussion was to determine as far as

possible the number and distribution of the British species comprised in these families. The total number of species was but small, as we had only from 130 to 150 species in Britain. The extreme difficulty lay in finding out the correct names for these species. For this there was a double cause, (1) the paucity of British species as compared with the richness of the European fauna; (2) the inadequate descriptions of supposedly well-known species. To quote an extreme case, we had certainly two species of *Anthrax* in England, as against over 100 names of species in the "Katalog der Paläarktischen Dipteren" published last year; it might naturally be assumed that nothing could be easier than to identify these two species which had been so thoroughly well known for at least ninety years, but the exact contrary was the fact. *A. fenestratus* of Fallén (1814) had been supposed to be known to everybody as occurring all over Europe, and it was not until 1869 that Loew called attention to the fact that Fallén's species was apparently restricted to Middle and North Europe and North Asia, while at least four allied but quite distinct species occurred in South Europe, as well as two others in North America. This was all very well in its way, and the four new species were well described, but then the question presented itself, what Fallén's original and apparently well-known species might be, and it was not until a most careful search brought to light Zetterstedt's description in his "Insecta Lapponica," that he was able to identify it with our species. Of course it might be said that he could identify it by comparison with European specimens, but he was not fond of named specimens for comparison when an adequate description was accessible. That description of Zetterstedt's and that description only convinced him that ours was the true *A. fenestratus* of Fallén. So much for one of our species of *Anthrax;* now for the other. Soon after he commenced to study our British Diptera he received from the late Nicholas Cooke some specimens of a clear-winged *Anthrax*, and being desirous of obtaining a good series so as to name it with certainty, he requested Cooke to catch him a number in perfect condition. Cooke did so, and sent him a long series. Unfortunately he still found a difficulty in deciding upon its

name, and so it remained in his collection as only probably *A. paniscus* of Rossi. More recently Dr. D. Sharp had found it within a few miles of his own house, and suspecting that we had two or three clear-winged yellow species of the genus in England, he got Mr. J. E. Collin to secure further specimens from this locality, and about the same time Mr. C. J. Wainwright allowed him to examine a very long series in beautiful condition which had been caught at St. Ives, in Cornwall. The result of his studies, commenced thirty-four years ago, was that he was convinced that all these specimens belonged to one species only, of which the male had often figured in collections under one name, the female under another. Still, he was not convinced, but believed that we have one or two more closely allied British species of which he had been unable to meet with recent or good specimens until he saw two specimens which clearly belonged to a distinct species now exhibited. At various times there had been recorded as British of the clear-winged yellow species of *Anthrax:* (1) *A. paniscus*, Rossi; (2) *A. hottentottus*, Linné; (3) *A. flavus*, Meig.; (4) *A. concinnus*, Meig., which is believed to be a synonym of (5) *A. abbadon*, Fabr.; (6) *A. fasciatus*, Meig.; (7) *A. leucostoma*, Meig.; (8) *A. cingulatus*, Meig.; (9) *A. venustus*, Meig.; (10) *A. circumdatus*, Meig.; and (11) *A. bimaculatus*, Macq.; of these, all except *A. flavus*, *A. concinnus*, and *A. bimaculatus* remain as species in the recent 'Katalog,' but he did not believe they represented more than four species at the utmost, and nowhere could he find a good description of a single one of them, while he was convinced that the scattered notes and inadequate descriptions given by various writers were hopelessly intermingled in synonymy. Further than this, it was to be borne in mind that many more species had been described in recent years which belonged to this same group, though he would admit that in most of these recent descriptions greater care had been taken for discrimination, and the species could be recognized so that he could distinguish all of them from our common British species. He supposed he should have to cut the Gordian knot, and call our species *A. paniscus*, give a good description, and leave posterity to deal with it. But after all until this evening he had been no further forward as to the probable other British species or two.

In *Bombylidæ* he recognized satisfactorily seven British species, but we had about 32 'names' of other species reputed as British, and those 32 names belonged to about 25 good species, which were some of the handsomest species in all the Diptera. He accounted for this in the belief that our early English workers occasionally travelled on the Continent, and while doing so collected and naturally pinned their specimens in their accustomed way, and by and by these specimens found their way into their general collection, and were thus believed to be British-caught specimens; naturally, when travelling they would have been attracted by the showy *Bombylidæ*.

He added a comparison between the British and the Palæarctic species in these Families.

	Palæarctic.	British.
Stratiomyidæ	about 236	about 54
Leptidæ	,, 95	,, 19
Tabanidæ	,, 202	,, 21
Bombylidæ	,, 515	,, 7
Cyrtidæ	,, 38	,, 3
Therevidæ	,, 89	,, 10
Scenopinidæ	,, 13	,, 3
Asilidæ	,, 599	,, 24
Nemestrinidæ	,, 32	,, 0
Mydaidæ	,, 14	,, 0
	1833	141

But even of our 141 he could not at present guarantee above 122 as well-distinguished British species.

Colonel J. W. Yerbury said that on behalf of Professor E. B. Poulton, F.R.S., he had been asked to exhibit some specimens belonging to the Dipterous Families *Stratiomyidæ* to *Cyrtidæ* according to Verrall's List.

The exhibit was of interest mainly on account of the specific names used, which names were useful as showing the nomenclature employed by a past school of dipterologists, and might give a clue to the manner in which some reputed species have found their way into the British List.

The species to which Colonel Yerbury particularly wished to draw attention were as follows:—(i.) *Ephippiomyia ephippium*, an insect reputed to have been taken at Combe and Darenth Woods. This specimen, though placed in the British Collection, was without doubt of German origin; (ii) *Isopogon brevirostris*, probably the identical specimen referred to in Curtis' British Entomology, as having been taken on The Devil's Ditch, Newmarket; (iii.) *Laphria marginata*, stated to have been bred from a hornet's nest, and (iv.) some specimens of an Asilid taken by Mr. Holland at Tubney Wood, near Oxford, and which might prove to be *Machimus rusticus*, an insect with a doubtful claim to a place in the British fauna.

Mr. Colbran J. Wainwright exhibited and commented upon two specimens of *Anthrax* referred to by Mr. Verrall. He said that hitherto Mr. Verrall had believed that we had only two certain species of *Anthrax* in this country, *A. fenestratus* and *A. paniscus*, but that these two specimens, though allied to *A. paniscus*, were abundantly distinct, and could be separated at a glance by the much darker fore-edge to the wings, differing besides in other respects. One had been taken by Mr. R. C. Bradley at Bournemouth, the other by Mr. W. G. Blatch at Poole. At present no name could be given to the species, as although there were plenty of names to choose from, there was but little in the published descriptions to assist us to recognize the species represented by any one of them.

Dr. F. A. Dixey and other Fellows joined in the discussion.

Wednesday, May 4th, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Exhibitions.

Mr. W. J. Kaye exhibited a piece of a plant of *Eupatorium macrophyllum* from British Guiana. It was stated that the white flowers were very attractive to the *Lycorea*, *Melinæa* and

Mechanitis species of that region. Vast numbers were often to be seen congregated on one single bush. Species of *Heliconius* were also found on the same plant, but only occasionally, and it was significant that only those species that agreed closely in pattern and coloration with the *Ithomiinæ* were so found. He also exhibited a remarkable larva-like twig of birch. The resemblance was so complete that even the head, the segments, the appressed legs and the anal claspers appeared to be represented, while the pose of "the larva" was most life-like. It had been found on Oxshott Heath whilst he was searching for larvæ of *Geometra papilionaria*. He also exhibited on behalf of Mr. C. P. Pickett a pupa of *Rumia cratægata*, the larva of which had spun up in an empty pupa case of *Pieris brassicæ*. The latter was on the roof of a breeding-cage and the Geometrid larva had completely crept inside to spin its cocoon.

Mr. J. E. Collin exhibited a specimen of *Corethra obscuripes*, v. d. Wulp (? = *C. fusca*, Staeg.), a little-known species of the genus, and new to the British List, which he had found in some numbers round a recently-formed pond in Mr. G. H. Verrall's garden at Newmarket.

Mr. G. T. Porritt exhibited a living larva of *Agrotis ashworthii*, of which he had found considerable numbers on one of the mountains of Carnarvonshire during the last week in April.

Commander J. J. Walker, R.N., exhibited a gall sent him by Mr. Harold S. Mort, identified by Mr. Froggatt as *Brachyscelis duplex*, Schrader, and found at Wentworth Falls, Blue Mountains, N. S. W., where it was by no means common. Mr. Mort wrote that he thought at first it was made by joining two leaves, but noticed afterwards that it grew direct from the trunk of the tree (a Eucalyptus), while Mr. Froggatt had informed him that the whole of the gall (which resembled a large locust-bean), including the ears, was made by the insect.

Mr. G. H. Verrall exhibited three specimens from the Hope Collection at Oxford of *Neoitamus cothurnatus*, Meig., an Asilid not previously recorded as British. They were taken near Oxford by Mr. W. Holland.

He also stated that the *Anthrax* exhibited at the last

meeting on behalf of Mr. R. G. Bradley was *A. circumdata*, Meig., a species recorded before, but not observed for more than fifty years past.

The President exhibited a Longicorn beetle captured near Malvern, Natal, by Mr. C. N. Barker, together with a large Bracon from the same locality. The following extract from one of Mr. Barker's letters indicates the close superficial resemblance which exists during movement between two insects which as cabinet specimens appear to bear no marked likeness to each other. "The large yellow and black ichneumon, when on the wing, bears an extraordinary likeness to the Longicorn *Nitocris nigricornis*, though no one would suspect a similarity in the cabinet. It is perhaps similarity of flight coupled with coloration that produces the effect, which has more than once deceived me."

The same resemblance had been observed by Mr. Guy A. K. Marshall, who placed the same or closely allied species in his great Lycoid group (Trans. Ent. Soc. Lond., 1902, pl. xviii, figs. 29, 45).

Mr. H. J. Turner exhibited living larvæ and cases of several species of the Lepidopterous genus *Coleophora*, and contributed the following notes :—

"(1) *C. conyzæ*. A very local species, but interesting on account of its industry in making cases. In its earlier pre-hibernating stage it is a leaf miner, and for its winter accommodation it makes a short, straight, slender, cylindrical case of silk, (?) which becomes almost black before spring. When early spring brings on a recommencement of feeding, the young larva selects a position, often near the tip of a leaf of its food-plant, *Inula conyza*, affixes its case, mines into the leaf, and after eating out a considerable area, makes a new case from the cuticle of the blotch. This is much too large for the larva, but in a short time, even before the larva grows sufficiently large to fill it, it is abandoned and a still larger one formed. I have not yet ascertained how many cases an individual larva will make, but there are always three if not more. Mr. Sich tells me that a larva will re-enter its case after being expelled. This must of course be by the head end, since the anal end is closed by adpressed valves. The

size of the case no doubt facilitates the larva in turning round in it. I believe this habit of re-entering a case after expulsion or voluntary exit, is unusual in the genus; in fact, with numerous species, it is practically impossible from want of room to turn round. The larva is also interesting in possessing only three pairs of abdominal legs, which fact, if other characters collateral with it be found, may perhaps be a basis for the subdivision of this huge genus of closely resembling species.

"(2) *C. troglodytella.* The larva of this species is found upon *Inula dysenterica, I. conyza,* and *Eupatorium cannabinum* in some abundance. Its case is cylindrical, with oblique head-opening, and is composed of silk. It is never abandoned when too small, but is enlarged by the making of a slit on the lower side and filling in with silk, at the same time being lengthened at the anal end. The colour is white, which becomes dirty in time, that portion of the full-sized case which formed the winter case being frequently almost black. This species is abundant in a few localities.

"(3) *C. lixella.* This is a very local species confined to a few dry chalky slopes. It is remarkable for feeding after hibernation on various grasses, whereas its food before the winter is the heads of wild thyme. Very few species feed on plants so far removed in their relationships. Its case for wintering in is formed of a number of dried flowers of the thyme, and is very irregular. These cases may occasionally be found in the early spring affixed to grass-stems, the larvæ having vacated them, mined into blades of grass, and constructed therefrom cases having portions of the dried cuticle placed upon them lengthways, and lined with silk.

"(4) *C. laricella.* A species feeding upon larch-needles, and notable as being a very destructive pest in some districts. This has recently been shown at a meeting of the Society. All the above species were received from Mr. Eustace Bankes, to whose kindness I am very much indebted. They were from the Isle of Purbeck.

"(5) *C. hemerobiella.* A species which feeds upon hawthorn, pear, apple, etc., and interesting as being one of the first species of the genus to attract the attention of naturalists.

Johann Frisch in his 'Allerlei Insekten,' in 1721, figures what is probably this species and describes its habits at some length. Its early case is a very small segment of a ring, this is lengthened at the head end until the shape is somewhat like a semi-circle; the lengthening of one end still continues and we get a crook-shaped case. Finally this case is abandoned and a new one built on different lines altogether, being cylindrical, straight and affixed almost vertically on the leaf into which the larva mines.

"(6) *C. solitariella.* This species feeds upon *Stellaria holostea* and makes a white case of silk. When discovered in this country it was exhibited at the Society's meetings on more than one occasion by Messrs. McLachlan, Stainton and Douglas. The above two species were sent me for examination by Mr. Sich, who takes them each year in Chiswick.

"(7) *C. pyrrhulipennella.* A species which is found commonly on heather. It makes a jet-black silken case, somewhat curved and with a conspicuous keel along the under-side. A larva which has been extracted for examination was of a very bright orange colour. The example exhibited was sent me by Mr. Main, and was from the New Forest.

"(8) *C. alcyonipennella.* A species which feeds upon *Centaurea nigra.* I met with it upon the Ranmore Common side of the Box Hill District. It belongs to that section of the genus of which the imagines have more or less of a metallic gloss.

"This genus is a very extensive one, our British species alone numbering about eighty, while many more occur upon the continent of Europe, and others in N. America. I should be pleased to receive any species, which Fellows of the Society may meet with, to aid Mr. Sich and myself in our investigation of this difficult but fascinating group."

Papers.

Dr. A. Jefferis Turner, M.D., communicated a paper entitled "A classification of the Australian *Lymantriadæ.*"

Dr. F. A. Dixey read a paper, communicated by Major Neville Manders, R.A.M.C., entitled "Some Breeding Experiments on *Catopsilia pyranthe*, and Notes on the Migration of Butterflies in Ceylon."

The President said that his friend Professor E. A. Minchin of University College, London, had communicated the following observation of an attack made by a bird upon a species of *Elymnias*:—"Apropos of the footnote on p. 9 of your address at the Internat. Zool. Congr. at Berlin (1901), the following observation may interest you. It was made upon the common *Elymnias undularis*, at Aska in the Ganjam District of Madras, when I first went out, and this butterfly was then a novelty to me. As you doubtless know, the ♀ mimics *Danais chrysippus*, while the ♂ is totally different. It has rather skulking habits, keeps close in the shelter of the thickets, settles frequently, and seldom emerges into the open. When it does it soon takes cover again. One day I was pursuing a ♂, and succeeded in driving it out from amongst the bushes into the open, and was running it down and was on the point of capturing it, when a bird swooped down and carried off the butterfly right in front of my net. I do not know the species of bird, but it was of small or moderate size. It is curious how many people deny that birds eat butterflies."

The President then read part of a letter recently received from Mr. J. C. Kershaw, one of the Fellows of the Society, living at Macao. The following observation throws much light upon the struggle for life endured by one species of butterfly at this locality:—"There is a cuckoo here (*Cuculus micropterus*) which certainly accounts for some species of butterfly being rare. Having shot several I found the stomachs crammed with what were obviously butterfly larvæ, some almost entire, and after a search found the same kind on a banyan. They were *Rhopalocampta benjamini*, a Skipper which I had always accounted very rare here, but of which I now have a good series. At intervals through the summer I shot these cuckoos, and always found them stuffed with caterpillars, mostly the larvæ of this large Skipper, which has a bright red and black head, unmistakable amongst the

stomach contents, besides a few evidently only just swallowed."

A discussion on the bird enemies of lepidoptera followed, in which Mr. E. Merrifield, Commander J. J. Walker, Mr. M. Burr and other Fellows joined.

Wednesday, June 1st, 1904.

Professor E. B. Poulton, D.Sc., M.A., F.R.S., President, in the Chair.

Election of Fellows.

Mr. Arthur F. Bayne, Gerencia, Ferro Carril del Sud, Plaza Constitucion, Buenos Ayres; Dr. Simon Bengtsson, Ph.D., Lecturer at the University of Lund, Sweden; Mr. G. Bertram Kershaw, Ingleside, West Wickham, Kent; Mr. W. A. Nicholson, 36 Promenade, Portobello, N.B.; and the Rev. Thomas John Robert Armine Slipper, M.A., Tivetshall Rectory, Norwich, were elected Fellows of the Society.

Obituary.

The President said the meeting opened with a deep sense of the loss which they had sustained in the death of their Treasurer—a loss which would be grievously felt by entomological science throughout the world. It was not possible at that time to speak of the details of the services rendered by Robert McLachlan to the science which was the dominant interest of his life; but in bringing before the Fellows of the Society the Resolution submitted by the Council, he must allude to two chief features of the lamented naturalist—the breadth of knowledge which made him so valuable and helpful a member of their community, and the intensity of his devotion to the interests of the Society.

On the motion of the President, seconded by Mr. G. H. Verrall, it was then unanimously resolved to express on behalf of the Society sincere sympathy with the family of the deceased in their bereavement.

Election to the Council, and Election of Treasurer.

The PRESIDENT announced that in accordance with the Bye Laws of the Society, Mr. ALBERT HUGH JONES had been elected a member of the Council, and also elected to the Office of Treasurer in the place of the late Mr. Robert McLachlan.

Exhibitions.

Mr. E. B. GREEN exhibited various insects from Ceylon, including (1) a "Carpenter Bee" (*Xylocopa fenestrata*, Fab.) and a large Asilid fly (*Hyperechia xylocopiformis*, Wlk.), which very closely mimics the bee. It is supposed that the Asilid preys upon the bee. The specimen exhibited was observed circling round a Xylocopa and was then mistaken for the male of that insect. But its subsequent attitude—when at rest—betrayed its true nature and led to its capture. (2) Specimens of a Mycetophilid fly and cocoons from which they emerged. The latter were attached to leaves and pieces of wood and showed a beautiful structure, being formed of an open network of white anastomosing threads. (3) Examples of a Tineid moth and its remarkable larval cases. The case consists of a narrow tube—more than an inch long—with numerous short diverticula at regular intervals along each side. The larva anchors this case to the bark of the tree and exserts its head from either extremity or from any of the lateral diverticula, to feed upon the surrounding lichens and minute algæ. When it has exhausted the food within reach, it severs the connecting strands and drags the case to a fresh part. Above the middle of the tubular case is a thickened pad beneath which the larva rests when moulting and under which it finally pupates.

Mr. H. St. J. DONISTHORPE exhibited specimens of the rare beetle *Tachys parvulus*, taken in the New Forest in May.

Mr. J. E. COLLIN exhibited specimens of *Mochlonyx velutinus*, Ruthé, a rare British *Culicid* which he in company with Messrs. Verrall and Wainwright had found in numbers near Beaulieu in Hampshire on May 22nd. It was first recorded as British by Walker in 1856 from two females in Mr. Clifton's Collection under Haliday's name of *effoetus*, though it should

be noted that the male is figured and the species is called *M. velutinus* in the description of the plate, and as these figures were communicated by Haliday it would seem to indicate that he recognized *effoetus* as a synonym of *velutinus*, Ruthé; in 1871 Mr. Verrall took a single female at Leigh in Essex, and Theobald in his Monograph of the *Culicidæ* says "there are specimens in the British Museum and Mr. Bignell has also specimens."

Meinert published in 1883 a paper on a species he called *Mochlonyx culiciformis*, De G., which appears to be identical with our species, but it is doubtful whether he is correct in reviving De Geer's name, unless the larval characters, described and figured by De Geer, are sufficient to warrant the assumption that his insect was a *Mochlonyx* and not a *Corethra*.

Mr. A. J. Chitty exhibited an Ophionine ichneumon, with a fungus of some sort attached to the head. Dr. T. A. Chapman suggested that a similar appearance was derived from the pollina of orchids forming a feathery mass on the head, while the President mentioned that the maxillæ and palpi of moths covered in the same way with the pollen of flowers also made the insect look as though it was covered with fungus. Mr. Chitty also exhibited *Machærites glabratus*, Rye, which had been taken by him along with the rare ant *Ponera contracta*, thus confirming Mr. Newbery's suggestion that the beetle lives with the ant.

Mr. C. P. Pickett exhibited long series of *Angerona prunaria* and *Lycæna corydon*, showing a remarkable range of variation in both species.

The President exhibited specimens of *Paltothyreus tarsatus*, Fabr., an ant belonging to the family *Poneridæ*, recently received from Dr. S. Schönland, Curator of the Albany Museum, Grahamstown. Colonel Bingham had kindly named the specimens and had pointed out that an allied species bears the name *Megaponera fœtens*, Fabr., indicating a similar power of emitting an offensive odour. Some of Dr. Schönland's specimens, which had come to this country in spirit, had been dried and mounted on cards. These, after the lapse of a few days, still retained a very unpleasant smell. Dr. Schönland had sent the following statement on the subject :—

"On a recent trip (Sept. 1903) to the North-eastern Kalahari, we noticed on our first outspan, about eight miles west of Palapye Road Station, an awful stench, which, however, passed off after a time. It turned out afterwards that it emanated from some ants living in trees. We noticed them again at Serowe, Khama's capital, but unfortunately there was no opportunity then to make any detailed observations and we did not meet with them again, although I was told that they are not uncommon in Khama's country. Recently a friend of mine, Mr. S. Blackbeard, of Serowe, sent me some from Mapellapveda, about forty-five miles N.W. of Palapye Road Station, and I forward a few of them to you by this post. I have never come across any notice of them. Have you? They open up a wide field of biological enquiry. How do they produce the stench which comes near that awful stench of the well-known *Caralluma lutea* (an Asclepiad plant) found in the same neighbourhood? Can they let off their artillery at will? Do they use it as a means of defence, or, like their friend the Asclepiad, do they mean it to attract flies?"

The PRESIDENT exhibited a cluster of the green eggs of *Vanessa urticæ* fixed to the under-side of a small leaf towards the summit of a nettle-stem. The cryptic resemblance of the eggs to their environment was very remarkable. The eggs had been sent for exhibition to the Society by Mr. A. H. Hamm of the Hope Department, Oxford University Museum. The following observations upon the oviposition of a part of the exhibited egg-mass were recorded by Mr. Hamm:—

"While walking along the Shotover Road near Oxford on Sunday morning last (May 29), my attention was directed to a specimen of *Vanessa urticæ* which was sitting motionless with wings expanded horizontally on the upper-side of a small leaf near the top of a nettle-stem. On looking more closely I found that the butterfly was engaged in ovipositing, the abdomen being curved round the edge of the leaf so that the eggs were deposited upon the under surface. When first seen she had laid about half of the batch now exhibited. Although the cluster does not present any approach to a regular form, the butterfly was apparently always very careful to feel with

its ovipositor before extruding an egg: sometimes, indeed, she felt all over the mass before selecting a site. So engrossed was she in the work that when lightly stroked on the thorax she merely shut her wings with a snap and continued ovipositing. She was disturbed several times with the same result. The whole period of observation was fifteen minutes, during which about half the eggs were laid. The insect laid the last egg at 11.20 a.m., and then flew away voluntarily.

"The eggs retained the bright green colour, which concealed them very effectively, until some time between 5.30 p.m. on June 7 and 7.45 a.m. on June 8. When examined at the hour last named they were found to possess a dark leaden colour, which was unchanged at 5 p.m. on the same day. At 7.40 a.m. on June 9, the young larvæ were distinctly visible through the transparent glassy shell, and by 2.40 p.m. they were hatching. The eggs, being laid in a heap, could not be counted, but a careful search on June 21 revealed the presence of 87 larvæ."

The PRESIDENT said that Mr. Hamm's interesting contribution to our knowledge of the life-history of this common species induced him to put on record the details of some observations of his own in 1900 upon the courtship and pairing of the same butterfly, so that both sets of notes might be published together:—

"On May 11 of the year 1900 I was fortunate enough to witness the courtship and pairing of a hybernated male and female of *Vanessa urticæ*. I was crossing a meadow of long grass bordering the river Cherwell just above the Oxford University Parks, when the butterflies flew past me, the male closely pursuing the female. The time was 3.45 p.m., and the sun was bright and warm. The insects flew low, just above the grass. The flight was rather slow and the direction winding, often bringing them over the same spot, so that although they alighted many times in the thirty minutes during which I watched them attentively, the observations were conducted on a spot of ground not more than a few yards square. Whenever they alighted the same attitude and the same relative positions were maintained, both insects resting with outspread wings, the female immediately in front of the male. The

head of the male was close to, and generally over the anal angle of one hind-wing of the female. So far as it was possible to follow them with the eye during their flight, the same relative position was maintained, the male following so closely that his head was probably often in contact with the hind-wing of the female. They alighted two or three times in the positions I have described, but were probably disturbed by my attempts to approach them. In a few minutes, however, they came to rest, and remained for about twenty minutes, during which I was able to observe them closely at a distance of about three feet. The male appeared to show excitement, especially in the earlier part of this period, in the frequent quivering of his wings, and occasionally in the much slower scratching movements of his second pair of legs. As far as I could see, these movements were not felt by the female and did not affect her. Of far greater interest was the movement of the head and antennæ, which evidently perform an epigamic function of considerable importance in this species. From the previous description of the relative positions it is clear that the antennæ as well as the head of the male overhang the hind-wings of the female. During the earlier part of this period the male's head was jerked repeatedly up and down, the knobs of the antennæ being of course moved through a large arc. At the same time I heard a succession of clicks distinctly synchronous with the jerks and evidently due to them. I have no doubt that the clicks were caused by the rapping of the male's head or the knobs of his antennæ upon the hind-wing of the female. The movements were extremely rapid and were many times repeated. The female remained apparently passive throughout the period, but three times she shut her wings up with a snap and remained in this attitude for a few seconds. At other times her wings were spread out flat, the anterior pair not being directed sufficiently far forward to bring their costal margins quite into line. The position of the wings of the male was not equally uniform, but they were always more or less outspread even when made to quiver. After about five minutes from the beginning of this long period the signs of excitement became much less marked, while the rapping movements only

took place occasionally. Finally the insects rose again and flew round in the same manner as before, similarly alighting two or three times for a few seconds. On one occasion, perhaps the first time after the long rest, they dived deeply into the grass, and I saw them fluttering together far down and almost hidden. They soon emerged, however, and finally alighting again, the male recommenced the rapping movements. On this occasion, however, the process was very brief, lasting for perhaps a quarter of a minute; they rose again and almost immediately darted into the long thick grass. Again I saw them fluttering far below the surface, but in a few seconds they had come to rest side by side on the underside of a buttercup-leaf. Coitus had already taken place, and the extremities of the two abdomens were bent round into a U. The wings of both were closed and were hanging downwards. The leaf on which they were resting was some inches below the top of the long grass. They were completely hidden and could only have been found by tracking them as I had done. They were now completely quiescent when the grass was disturbed in order to examine them more closely, when the buttercup-stem was picked, and even when I removed them, still side by side, between my finger and thumb. In this manner I carried them a few hundred yards and then took them home in a box and placed them in a cylinder with some green leaves, upon one of which they immediately took up a position similar to that which they had occupied on the buttercup-leaf. From 4.15 p.m., when coitus took place, they remained until 11.15 p.m., when I disturbed them in trying to ascertain whether pairing had come to end. Under ordinary circumstances it is improbable that they would have separated until the next day.

"In one respect the observation is incomplete. Courtship had already begun, and had been going on for an unknown period when the butterflies were first seen.

"In spite of this hiatus in our knowledge the observations here recorded throw much light on an obscure part of the natural history of this species. We now know by a direct observation that pairing takes place between hybernated individuals in the spring—a conclusion which was long

ago reached upon other grounds, as the following letters indicate.

"Mr. G. C. Barrett wrote to me on the subject on May 14, 1900 :—

'My experience on the point you mention is not large, and if you have definitely noticed the period of pairing of *Vanessa urticæ* it is of great interest. Of course I have seen the male pursuing the female in the sunny days of spring, and also have found it—both sexes, I believe—hybernating in August when but just from the pupa, but I cannot remember that I have seen actual pairing in this species—or in any *Vanessa* except *cardui*. On very hot days at the end of May and beginning of June worn females of this species may be seen flying in a wild manner, pursued closely by still more worn and tattered males; and *once* I saw them after this wild rushing about settle down on a branch of an oak-tree, and pairing at once took place. I *saw* the action of copulation, and left them paired on the tree.

'I think that all the species pair in the spring—I might even say that I do not think that the ♂ would live through the winter if *they had* paired! but this is merely opinion, though with good reason to back it.'

"Mr. J. W. Tutt wrote on May 15, 1900 :—

'I have no notes upon the pairing of *Vanessa* except that on more than one occasion when *polychloros* has been abundant in the autumn and emerged early after a specially fine summer I have seen occasional pairs in the autumn. I suspect all such autumnal pairings are unusual, and that eggs are laid and the progeny exterminated. Still I have never seen any spring pairings, I think, of this species, and may be wrong. I believe I have seen *io* paired in spring.'

"Dr. Chapman wrote on May 16, 1900 :—

'You will see all I know on the point in E. M. M. for 1891, p. 22. I don't think I have seen a *Vanessa* in cop. But we know that males and females equally hybernate. I think it has over and over again been proved that female *Vanessa* are immature in autumn. I don't know that the same has been shown for the male, but it probably is so. I have seen male *Vanessa* following up the females in spring, but I cannot refer

you to any observation of my own (or any one else's) of the actual pairing.'

"One chief interest of these observations upon *V. urticæ* and of Mr. Barrett's upon *P. cardui* is the evident instinct to hide immediately before pairing and to remain hidden during the period of copulation. This instinct, which probably accounts for the deficiency in our knowledge on the subject, is readily explicable when we remember that the insects become motionless, unaffected by disturbance, and thus an easy prey to any of their enemies."

Mr. A. J. Chitty confirmed the President's observations. In April 1903, during the Easter holidays at Huntingfield, Kent, he watched a pair of *Vanessa urticæ* flying together in a part of a small wood where the trees were thin; the female settled on the ground and the male behind it with its head in the same direction. The male walked up from behind until it was almost touching it, and then commenced tapping the hind-wings of the female with its antennæ. During the time the insects were remarkably tame, and allowed him to stand quite near them. The female from time to time flew away and the male followed, and they settled again and repeated the performance. He watched them for about forty minutes, hoping to see them pair, but they eventually flew away to another part of the wood.

Dr. T. A. Chapman exhibited two very interesting Erebias caught by the President on the Guadarrama (near Madrid, Spain) on July 25th, 1902. These were the only two taken, although others were seen. The elevation at which they were met with was probably about 6000 feet. Though taken together and very much alike, they proved to be of two species, viz. *E. evias* and *E. styyne*, both males. Dr. Chapman remarked that they were the same two species which he found last year in Spain associated together and closely resembling each other, which is not their habit in Switzerland. Continuing he said: "Being single examples, we may fall into error, in assuming them to be typical of the forms of these species occurring in the Guadarrama, but no other course is open to us. The *Evias* is much nearer the Swiss form than the Canales specimens, in having the third apical spot well-developed and the rust-

colour but very slightly yellow, and is rather larger than the average of specimens from Canales. It is of the *Hispanica* form in having the rusty band broad towards the costa, and is *sui generis* in the band having its internal border very straight. No Canales specimen quite approaches it in this respect. No Canales specimen is quite as Swiss as this one in the development of the third spot.

"The straight internal border of the rusty band is as marked in the specimen of *Stygne*, and is here a much more remarkable and unusual variation. It resembles to an extreme degree on the upper-side *Neoridas* and *Goante* and differs from any *Stygne* I have ever seen. In other respects it is nearer Swiss *Stygne* than my var. *hispana*, being of smaller size and less strongly and brightly spotted. Each specimen taken alone is not so different from Mid-European forms as the Canales specimens, they differ in the same way and add the special feature of the straight inner border to the red band; and are thus quite as much like each other as the same species are at Canales. This seems to be a purely Spanish feature of these species, since Swiss examples do not resemble each other and rarely occur together. As regards *Evias*, the breadth of the band at costa is one character of var. *hispanica*, but I think the straightness of its inner margin is special and neither character has ever been noted in *Stygne*. The var. *bejarensis* of *Stygne*, otherwise so different, is very close to it in this respect.

"I have placed for comparison with them, (1) an average Swiss specimen of each, (2) the nearest to them that I can select from the Canales specimens, and (3) average Canales specimens of both species.

"As these specimens are both males, comparison of the females is not possible, but I put in also a Canales female of *Evias*, and three females of *Stygne*, a Swiss, a Canales and a Bejar specimen, to show how the latter (which is not associated with *Evias*) goes right away from the other forms male or female, but in the direction in which the others leave the Swiss form, viz. in greater size, brighter colour and larger markings.

"I put also a *Goante* ♂ for comparison with the *Stygne*, with which it is almost identical on the upper side.

"1. These specimens are, individually considered, less removed from Mid-European forms than the var. *Hispanica*.

"2. Nevertheless they approach each other at least quite as closely as the *Hispanica* do.

"3. They especially do this, by an alteration in the form of the rusty patch, which is unusual to either species and more like *Goante* or *Neoridas*.

"4. Since Guadarrama is further from Mid-Europe than Canales, var. *Hispanica* must be regarded as more local than necessarily Spanish.

"5. Perhaps the most important point is that though they do it by a somewhat different variation, they keep to the Spanish rôle of the two species of associating together and resembling each other, a feature very rare or unknown in Mid-Europe.

"If it is permissible to found named varieties on single specimens, I would suggest that they be called *peñalaræ*. *E. evias* var. *peñalaræ*, differs from var. *hispanica* in having all three apical ocelli equally developed, and the rusty band less yellow. I think it is very possible however that a further series would render it impossible to distinguish *Peñalaræ* from *Hispanica*. *E. stygne* var. *peñalaræ*. This does not resemble any named or, so far as I am aware, known, variety in its most marked peculiarity, the straight inner margin of the rusty band. I should expect further specimens to agree in this and so make this *var.* a well-defined race."

Dr. Chapman also exhibited the ova, larval work, pupæ and imagines of Anthomyia, sp., (?) a dipteron that lays its eggs on a fungus, *Epichloe typhina*, Berk., common in June on grass stems. He had often wondered at the curious way of life of this larva, living under a case and burrowing out on the surface of the fungus, making labyrinthine tracks where it ate the incipient spore-bearing layer. As he could learn nothing more about it he determined to breed it in order to be able to discover its name. The specimens exhibited were the result. He had already found ova laid this year on May 27th. Mr. G. H. Verrall afterwards determined the species to be the *Anthomyia spreta* of Giraud (Ann. Soc. Ent. Fr., 1872, pp. 503–506) and Schiner, but not necessarily of Meigen, the

original describer, as Stein, who had seen Meigen's type, considered it to be a small specimen of *A. radicum*, L.

Mr. H. J. Turner exhibited several species of the Lepidopterous genus *Coleophora* and contributed the following notes on them :—

(1) *C. laricella*.—The cases and larvæ of this species were shown at the last meeting. A day or two ago several imagines emerged, a pairing has occurred, and there are in the box about a dozen ova. These are laid on the under surfaces of the needles, not near the base. They are of an upright type, having the micropyle at the top, have only two diameters, and are vertically ribbed.

(2) *C. albitarsella*.—This species generally feeds upon ground ivy, but these specimens were found upon marjoram, by Mr. Eustace Bankes, and will not touch ground ivy, even when in want of food. The cases are hairy, in fact hoary, being made of the rough cuticle of the leaves of the food-plant. When the larvæ feed upon ground ivy the cases are smooth and appear as if they were made of pure silk, blackened by a deposit of some kind. The examples exhibited are from the Isle of Purbeck.

(3) *C. bicolorella*.—This species feeds on nut and is generally local, but occurring in numbers where it is found. The cases are parti-coloured, and the small very darkened winter case persists as the anal portion of the mature case. The enlargements are made in such a way as to make the case very clumsy. When more room is required, the larva fixes on the edge of a leaf, and mining a considerable area, it bites through the two cuticles. The portion added overhangs the tubular portion very considerably with its irregular and serrated margins. The specimens exhibited were obtained at Chatham.

(4) *C. lineolea*.—This is a very common species and feeds upon *Ballota nigra*, especially frequenting dusty roadsides. It has a large, woolly case formed from the rough, hairy, wrinkled cuticle of the food-plant. Those exhibited were found near the Bromley Road, Catford.

(5) *C. viminetella*.—This species makes a clumsy case from the woolly leaves of the large willow *Salix caprea*, and at times it feeds upon other willows. It has a variegated case,

and is usually found low down on the bushes. Those shown are from Pollard's Wood, Chalfont.

(6) *C. currucipennella.*—This species feeds on birch. The cases are black, pistol-formed, with projections on the back, and the larvæ feed on the upper surface, an unusual occurrence in the genus. When consuming the young leaves the larva eats quite through, leaving a hole; when, however, it feeds upon older leaves, only the inner substance and the upper cuticle is eaten, the under cuticle remaining. The specimens exhibited are from Ashstead.

(7) *C. nigricella.*—A very common species on hawthorn. Its winter case is a curved one, and this is abandoned early in the spring soon after feeding re-commences on the new leaves. The larvæ wander much and leave a number of blotches, one on a leaf as a rule. Those exhibited were from Chatham.

(8) *C. discordella.*—A local species feeding on *Lotus corniculatus*. The case is a curiously flounced, cornucopia-shaped one, of a rich brown colour, the flounces being ragged and light in colour. Those exhibited were kindly sent me by Mr. Eustace Bankes and were from Dorset.

(9) *C. ochrea.*—I am also indebted to Mr. Bankes for this very local species, which feeds upon *Helianthemum vulgare*. The case is a parti-coloured one, and somewhat irregular, but becomes more cylindrical by age.

Papers.

Colonel Charles Swinhoe, M.A., F.L.S., read a paper "On the *Geometridæ* of Tropical Africa in the National Collection."

Mr. W. L. Distant communicated a paper entitled "Additions to a knowledge of the Family *Cicadidæ*."

The President communicated a paper by Mr. G. F. Leigh entitled "Synepigonic series of *Papilio cenea* (1902–3) and of *Hypolimnas misippus* (1904), together with observations on the life-history of the former," and exhibited specimens to illustrate the same.

Mr. Edward Saunders, F.R.S., F.L.S., communicated a paper on "Hymenoptera Aculeata from Majorca (1901) and Spain (1901–2)."

Major Neville Manders, R.A.M.C., F.Z.S., in his paper entitled "Some Breeding Experiments on *Catopsilia pyranthe*, and Notes on the Migration of Butterflies in Ceylon," began by observing that although the different forms of *C. pyranthe* in Ceylon certainly bore some relation to the seasons, they were all liable to occur all the year round. With the assistance of Mr. Wickwar he had ascertained that of sixty specimens captured during a migratory flight that took place in the hot, dry weather of February 1903, seventy-five per cent. were males, and sixty-four per cent. of the whole number were of the form more lightly spotted on the under-side; only four specimens, all females, bearing heavy markings in the same situation.

Several larvæ were collected at Colombo, nearly all in the same week, and were subjected to varying conditions of temperature and moisture. These conditions proved to be very destructive, only fifteen to twenty specimens coming to maturity out of quite two hundred larvæ. Most of the resulting emergences were represented in a photograph which was exhibited.

Dealing next with the question of migratory flights, Major Manders calculated that during a swarm in October 1895, about 98,000 butterflies passed through a space sixty feet broad in twenty-eight hours. The course of these flights was shown by coloured lines drawn on a map of Ceylon [exhibited]; the butterflies concerned being, besides the *Catopsilias*, *Papilio jason*, *Appias paulina*, *A. albina*, *Euplœa asela*, *E. montana*, *Danais septentrionis* and *Kallima philarchus*.

The migrations of butterflies differed from those of locusts in the fact that instead of advancing in one compact body, like a human army, the butterflies, in whatever part of the island they happened to be hatched, began migrating immediately; so that on the same day the migration was as vigorous in one part of the island as in another. During the migratory flights in the wet season, the female *Catopsilias*, which at this time largely outnumbered the males, deposited their eggs so hastily and in such enormous numbers that few of the resulting larvæ could possibly come to maturity. The survivors would probably be mostly males, the larvæ of that sex being

smaller and requiring less nourishment; this, in the author's opinion, accounting for the preponderance of the male sex in the dry-season flights. This periodical destruction from starvation of the female larvæ, and the consequent temporary predominance of males, might be regarded as a provision against the undue increase of the species.

Dr. F. A. Dixey remarked that though the results of Major Manders' experiments were numerically small, they were nevertheless of considerable interest. It appeared from the records of these experiments that the emergences all took place between the 5th and the 17th of December; and as the larvæ were collected in the same place and nearly at the same time, the butterflies might all be presumed to belong naturally to the same wet-season brood. It was remarkable that little or no difference was perceptible between the specimens kept at the ordinary temperature but in an atmosphere saturated with moisture, and those of which the larvæ were reared under normal conditions, and the pupæ had been iced. In both these cases the under-sides of the resulting butterflies tended to assume the macular appearance, the highest development of which was characteristic of the form generally called *gnoma*. It was also worthy of notice that the lowering of the temperature in the latter case did not appear to have retarded the emergence. But the aspect of the third row of specimens—those which had been subjected to excessive dryness—was widely different from that of the rest. Here, as shown by Major Manders' photograph, the maculæ were almost entirely absent; and the butterflies, or at all events the females, were of the form usually known as *pyranthe*. In spite of the small numbers concerned, it could hardly be doubted that this difference was significant; and the main result appeared, therefore, to be that while neither moisture nor cooling produced any alteration in the appearance of the ordinary wet-season form, the exposure of larvæ belonging to the same form to an artificially dehydrated atmosphere did cause them to assume the garb that was generally characteristic of the dry months of the year. It was to be hoped that the experiments might be repeated with larger numbers. A point that seemed to require some explanation was that whereas the author of the present paper had no doubt that

the specimens of *C. pyranthe* reared under conditions of drought were of the form that was commonest in the dry season, the late Mr. de Nicéville, on the other hand, spoke of the dry-season form as *C. gnoma*. It was perhaps possible that Mr. de Nicéville considered Fabricius's original description of *C. gnoma*, which mentions only one spot on the under-surface of the hind-wings, inapplicable to the heavily maculated phase recognized as *gnoma* by Moore (Lep. Ceylon, vol. i, 1880, p. 123), and by most other writers.

Correction.

Colonel J. W. Yerbury's remarks on the Warble Fly (p. xxv, Proceedings) were incorrectly reported, and should read as follows :—

The Warble Fly frequents elevated ground, and probably only comes down into the rich lowland pastures while in the larval state, and therefore in the backs of the cattle; the flies on emergence probably making their way back to the high ground at once. The smearing of the cattle with the various compositions recommended by Miss Ormerod and other economic entomologists is therefore useless, the gravid females not being in the neighbourhood of the beast at the time when it is applied.

Wednesday, October 5th, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of a Fellow.

The Rev. W. Beresford Watson, of St. Martin's Vicarage, St. Philip, Barbados, West Indies, was elected a Fellow of the Society.

Exhibitions.

Mr. G. H. Verrall exhibited specimens of (*a*) *Callicera yerburyi*, Verr., a Syrphid new to science, taken this year in Scotland by Col. J. W. Yerbury, and (*b*) *C. ænea*, F., the other British species of the genus, together with three

European species of *Callicera* from the collections of Bigot and Kowarz, *C. macquartii*, *C. spinolæ*, and *C. porrii*, Rond.

Mr. H. St. J. Donisthorpe exhibited *Tetropium fuscum*, L. (♂ and ♀), and eight specimens of *Abdera 4-Fasciata*, Curt., all taken by him at Market Bosworth, Leicestershire, in July 1904.

The Rev. F. D. Morice exhibited cells from Majorca constructed by two wasps, *Polistes gallicus* and *Eumenes coarctatus*. He said that the little pitcher-like cells of the *Eumenes* were often attached to shrubby plants, such as heath; but the specimen shown occurred, with many like it, on a stone wall, from which it was very difficult to remove it unbroken.

Mr. A. J. Chitty exhibited specimens of the earwig *Apterygida media*, Hagenb., better known as *albipennis*, found originally by Westwood at Ashford, and subsequently recorded only from Norfolk. He had taken the species at Huntingfield and Charing, Kent, this year.

Mr. W. J. Lucas exhibited a living specimen of *Labidura riparia*, ♂, from the shore near Christchurch, Hants, kept alive for more than a month, and fed upon fruit, meat, etc. He also showed a lantern-slide, depicting the threatening attitude assumed by this earwig when disturbed.

Professor T. Hudson Beare exhibited on behalf of Mr. C. J. C. Poole, who was present as a visitor, specimens of *Aulonium sulcatum*, Oliv., a species of Coleoptera new to the British fauna. The specimens were taken at Enfield in July of the present year under elm-bark in burrows of *Scolytus destructor*. The genus belongs to the family Colydiidæ, and is placed by Gangelbauer ("Die Käfer von Mitteleuropa") next to the genus *Colydium*. There are two European species in the genus, *sulcatum*, Oliv., and *ruficorne*, Oliv.; both are stated to be rare, and the distribution of *sulcatum* is said to be Central and South Europe, and it is a parasite upon species of *Scolytus*.

Mr. Walter Dannatt exhibited a specimen of *Papilio homerus* from the Blue Mountains, Jamaica, a species generally supposed to be confined to that island until Mr. Aaron, a Canadian entomologist familiar with the insect, stated that while on a trip through the "terra incognita" of St. Domingo

he had observed the species, unfortunately without being able to capture it. Coloured drawings of the larva painted by Lady Blake, and lent by Mrs. E. M. Swainson of Baltimore, U.S.A., were also exhibited, and Mrs. Swainson, who was present as a visitor, said that she was the only person who had found the larva. Giving some account of the life-history, she mentioned that it did not expose, in the larval state, the prominent eye markings, as, for instance, do some of the Chœrocampidæ, and for that reason probably it had escaped observation.

Mr. Dannatt also exhibited three new butterflies figured and described by him in the "Entomologist" of the current year, viz. *Chloripe godmani*, from Venezuela, *Monethe johnstoni*, from British Guiana, and *Delias hempeli*, from Gilolo, said by Dr. Dicksee to be a mimic of the only species of *Belenois* found in that island.

Dr. T. A. Chapman exhibited for Mr. Hugh Main a specimen of *Arctia caja*, bred this year, which he said was a teratological specimen such as he had never seen or met with, or, so far as he could recollect at the moment, had ever heard or read of. The insect had a three-fold hind-wing on the left side; not three wings of more or less imperfect development, as is not a very rare malformation; but the wing was at first glance a normal wing, and so far as the costa was concerned was apparently quite normal. Immediately below the costa, however, the wing divided into three layers, each of which was apparently a normal wing so far as form, colour and markings went, but which, when the insect was alive, were so closely applied to each other as to look like one normal wing, till by blowing between them or in some other way they were separated. The larval and pupal skins had not been preserved with it. Mr. Main was placing the specimen in the teratological collection in the British Museum, South Kensington. The President said he had no recollection of such a specimen being recorded.

Mr. F. Merrifield exhibited some pods, each of about three inches in length, in shape like the extended letter S, slender and tapering at the extremities, which he had found, late in August, attached to a slightly aromatic shrub growing on the

precipitous sides of a spur of the limestone cliffs at Rocamadour, Department of Lot, France. At first he took them for seed pods, but on opening them they were found to be galls tenanted by orange-coloured aphides. The twigs from which they grew had for several inches below the point of attachment a viscous varnish sufficient to protect them from insects only able to creep.

These galls are the subject of one of M. J. H. Fabre's Souvenirs, viz. the tenth of his eighth volume on *Les Pucerons du Térébinthe*, in which he describes the very interesting habits of some five gall-making Aphides on the *Pistacia terebinthus*; and especially of the one he calls *Pemphigus cornicularius*, Pass., which would appear to be the species exhibited.

Mr. Norman H. Joy exhibited: (*a*) the black variety of *Bledius taurus*, Germ., taken at Wells, Norfolk, August 1904: (*b*) *Bledius femoralis*, Gyll, from Wokingham, Berks.; a species that has not been taken in the British Isles for over fifty years: (*c*) *Polydrusus sericeus*, Schall., from Hampshire: (*d*) *Neuraphes carinatus*, Mul., from Bradfield, near Reading: (*e*) a small form of *Dyschirius politus*, Dej., taken by Canon Fowler at Bridlington, and himself at Wokingham: and (*f*) a *Rhizotrogus* (? species) taken in some numbers flying by day near Streatley, Berks., August 1904.

Dr. F. A. Dixey exhibited some preparations of the scent of male Pierine butterflies, and read the following note:—

"It has long been known that the male *Ganoris* (*Pieris*) *napi* emits a scent like that of lemon verbena. The fact is mentioned by Standfuss in his 'Handbuch,' and by Barrett in his 'British Lepidoptera.' The latter authority also remarks that the male of *Colias hyale* is said to have a smell like that of pineapple. In connection with work on the secondary sexual characters of the Pierines I have been attempting for some time past to verify the statements that have been made on this head, and also to ascertain whether other species of our common butterflies likewise possess a characteristic odour.

"In the summer of 1899 I made the following observations:— A fresh specimen of *G. napi*, ♂, when seized with forceps, gave out a strong perfume very like the crushed leaf of a 'lemon plant.' The wings removed from the body retained the odour,

which was also perceptible on the fingers when they had been used for rubbing the scales off the wing. A brush similarly used for removing the scales emitted the odour strongly. The body, though crushed, was odourless. A trial made with *G. brassicæ*, ♂, gave a negative result, but on subjecting a specimen of *G. rapæ*, ♂, to similar treatment, I fancied, but could not be absolutely certain, that a faint sweetish odour was perceptible.

"In the early autumn of 1900 I failed to detect any odour in a specimen of *Colias edusa*, ♂, which had been dead about twenty-four hours, but a few days later I repeated the trial with the following result:—A living *C. edusa*, ♂, was allowed to flutter about the room for a few minutes, then taken in the fingers and held gently. No odour was apparent, even when the so-called 'glands' on the costa of the hind-wing (which are well known to be absent in *C. hyale*) were uncovered. The 'glandular' patch of the right hind-wing was then carefully scraped with a penknife, and the little mass of scales thus detached was immediately smelt. There was a distinct sweetish and almost spicy odour which I should compare to heliotrope. It soon passed off, or I ceased to appreciate it. The patch on the left hind-wing was similarly scraped, with the same result, except that the odour seemed fainter. A trial was made with another specimen that had been dead at least twenty-four hours. As in the first case, I could not be sure that I detected the heliotrope odour. On crushing the thorax there appeared to be a slight scent somewhat like that of fresh varnish, and this seemed also to attach to the 'scent-scales' when scraped off the glandular patch. But it bore no resemblance to the perfume found in the living specimen. A few days later I convinced myself that the scales of the upper surface of the wings in *G. rapæ*, ♂, about which I had at first been doubtful, really possessed a sweetish, fragrant odour, somewhat like that of mignonette. Two ladies, whom I had not told what to expect, also immediately detected a scent in the scales from the same upper surface, which they described, without prompting, as 'flowery' and like 'mignonette.' Neither of the ladies had the least doubt or hesitation about their verdict. In *G. rapæ*, ♀, similarly treated, we could find

no trace of the odour. These observations were repeated three days later with fresh specimens, both male and female, and with the same result.

"In the course of last year (1903) I made several trials on common species in conjunction with Dr. Longstaff. Besides confirming previous results, we both detected a scent on the fore-wings of *Satyrus semele*, which to me seemed somewhat suggestive of chocolate. Dr. Longstaff has continued his observations both at home and abroad, and will, I hope, on some future occasion communicate his results to the Society. Last year I also obtained distinct evidence that the scent in *G. rapæ*, ♂, is confined to the scales of the upper surface. This perfume has been compared by Mr. Image to that of sweet-briar—which seems to me nearer the mark than my own suggestion of mignonette.

"During the present year I have been able to confirm Dr. Longstaff's opinion that *G. brassicæ*, ♂, possesses a characteristic odour. It is not easily appreciated, but when once caught is quite unmistakable. The best comparison I can make is with the petals of a scarlet geranium. I have again made trials with *S. semele*, ♂, whose scent has a slight pungency which I am now inclined to compare with that of sandalwood, though there is a delicate flower-like fragrance at the back of it. Trials were also made with *Pararge megæra*, ♂. The scent, as in the case of *S. semele*, appeared to be confined to the scales of the dark streak on the upper-side of the fore-wing. It was a faint, but heavy, sweet odour, suggestive of chocolate cream. It seemed to me to affect the back of the nose, even perhaps the pharynx, and to leave a kind of aroma which was enhanced by gentle expiration. *Lycæna icarus*, ♂, was found to have a faint scent also something like that of chocolate sweetmeats. This confirmed a previous observation by Dr. Longstaff. I am uncertain about *Epinephele janira*, ♂, but am inclined to think that a slight odour is present. I find also a faint scent in the scales of the upper surface of *Gonepteryx rhamni*, ♂, which I cannot describe further than by calling it 'flowery.'

"There is, I think, absolutely no doubt that the scent of the male butterflies examined is associated with the special male scales, which are in some cases distributed more or less

generally over the wing in the shape of the 'battledore scales' of Lycænids, and the 'plumules' of many Pierines, Satyrids and Nymphalids, and in other cases collected into the definite areas called variously 'chalky patches,' 'sex-brands' or 'glandular spots.' The proof of this is that scales removed from the wing are found to possess the odour strongly, provided that the special scales are present; the absence of special scales means the absence of scent. In *Colias edusa*, where the special scales are segregated, I obtained direct proof that the odour present in them was absent from the rest. The wings after being well rubbed retain little or no scent, nor does any appear to attach to the body. I reserve the case of *G. rhamni*, which has neither plumules nor circumscribed scent-patches, for later treatment.

"Though the special scent-scales seem to act as reservoirs and distributors of the perfume, they are not the seat of its manufacture. This is doubtless carried on by certain secreting cells, described and figured by Günther, which are found in connection with the sockets of the scent-scales, lying between the two layers of the wing-membrane. I have been investigating the structure of the scent-distributing apparatus in Pierines for some years past, and hope soon to be able to communicate my results, together with some account of the literature of the subject, which, though large, is scattered and by no means exhaustive.

"I may mention, in conclusion, that I have made several attempts to preserve the scent of various male butterflies, with more or less success. The first method I tried was extracting the wings with rectified spirit. This certainly took up the odour to some extent, but unless one uses the extract in a very concentrated form, the characteristic scent, which is seldom strong, is liable to be overpowered by the proper smell of the spirit. I then tried rubbing up the wings in a mortar with starch, choosing this as a practically odourless substance. In this way I got enough material diffusing the pleasant lemon-verbena scent of *G. napi* to make a small sachet. Unfortunately, however, the scent in this form does not seem to be lasting; at any rate, I have not as yet been very successful in preventing its evanescence. It soon disappears, as might be

expected, from butterflies being dried for the cabinet, though I have found it still strong in a specimen of *G. napi*, ♂, that had been eleven days in a cyanide bottle.

"I have here specimens of some of the common Pierine odours preserved in both ways—*G. brassicæ*, *G. rapæ* and *G. napi* in rectified spirit, *G. rapæ* and *G. napi* in starch powder. There are also, in similar bottles to the scents, samples of the spirit and starch used, in order to help in distinguishing any odour attaching to these substances from that due to the butterfly scales. I produce these specimens with some hesitation, because I am well aware that the perfumes are faint, and indeed are probably quite imperceptible to many people. That the bottles still retain sufficient odour to be easily discriminated by some persons, at any rate, I had proof this morning before bringing them here, and also this evening since entering the room."

Prof. R. Meldola, F.R.S., mentioned that he had already detected the scent of *Zanclognatha tarsipennalis*. The Rev. F. D. Morice said the scent of some species of Hymenoptera was characteristic and well known. Mr. J. E. Collin said that some Diptera emitted a musky scent, and Col. Bingham instanced the case of certain Eastern *Euplœinæ*. Mr. J. W. Tutt, Mr. M. Jacoby, the President and other Fellows joined in the discussion.

Mr. H. J. Turner exhibited examples of the larva of *Phorodesma smaragdaria*, which he had met with in some numbers on the Essex marshes while searching for Coleophorid larvæ. The protective resemblance attained by the attachment of numerous small portions of the food, *Artemisia maritima*, was well exhibited in a photograph sent to him by Mr. Edwards of Worcester, of several larvæ at rest on sprays of that plant. He stated that most of those he had met with were in situations which would necessitate their being under water at each high tide.

Mr. Turner also exhibited a further contingent of the living larvæ and cases of the Lepidopterous genus *Coleophora*, and contributed the following notes:—

"*C. therinella*.—A number of larvæ of this local species were very kindly sent me by Mr. Eustace Bankes from

South Dorset. They feed on the common field thistle, *Cnicus arvensis*, the leaves of which they blotch with innumerable small circular mines. On the back, near the head end of each case, is a two-lobed dark area, the weathered remains of the (first?) case of the young larva. These larvæ exhibited will hybernate, change to pupa in late spring, and emerge during the summer. But whether they have passed last winter as larvæ, which the indications of the young cases would seem to suggest, has not yet been ascertained. I found three cases of the species at Bromley a few days ago, and Mr. Sich has sent me one from Chiswick.

"*C. alticolella.*—For this species I am indebted, through Dr. Chapman, to the kindness of Dr. Wood of Hereford, who sent me a considerable number. The larva feeds on the seeds of *Juncus lamprocarpus*, and in the young stage mines into a seed, excavates the whole of the contents and uses the empty shell as a case. It then drills a hole, at or near the attachment of the seed, and walks off with it to the next one, into which it bores. This seed-case becomes too small for its tenant in due time, and the larva lengthens it by the addition of a silken tube with a three-flapped anal opening, this added part being much lighter in colour.

"*C. fuscocuprella.*—I am also indebted for this species to Dr. Wood, who a few days ago sent me the three cases and larvæ which I exhibit. The larva blotches the leaves of nut in the autumn, and makes a case curled downward to such an extent that the anal opening in the matured case almost touches the bellied portion. The back and sides of about one quarter of the length of the case, commencing just above the neck, are covered by a comparatively large bunch of leaf-cuttings, with the result that most of the frass extruded from the anal opening is retained in the kind of chamber between the case, the anal termination and the overhanging carunculated appendages.

"*C. artemisiella.*—This species I found last month in abundance by searching the *Artemisia maritima*, which grows on the retaining walls, on the banks of the creeks of S.-W. Essex. These cases are, when first obtained, extremely mealy, from the pollen of the flowers and the woolly epidermis of the food-plant. When most of this mealiness is removed they

will be seen to be longitudinally striped darker and lighter all round, the stripes being of even width. In the freshly-obtained cases this is very apparent, but in course of time a uniform tone is assumed from the exposure to weather, and also from the action of the water, when they are covered by the tide.

"*C. mæniacella.*—This species was found in large quantities by sweeping *Atriplex portulacoides*, *Sueda maritima*, etc. Presumably its case should be of a dirty whitish colour, but as its food-plants are covered by the extremely muddy water of the Thames, it becomes of all shades of dirty brown. In many cases this case appears irregularly streaked, especially on the under-side, where the additions to the width are usually inserted, and the newer portions contrast in shade of brown, and quantity of attached particles of mud.

"*C. argentula.*—This species is found commonly on Yarrow-seed heads. Those exhibited were found in the S. Essex marshes. I have also found cases at Hayes this autumn. The ground-colour of them is white, but they so soon get covered by the dusty *débris* of the flowers, pollen, dried frass, etc., and they bury themselves so considerably that they are most inconspicuous. The larva occupies a seed-head for some time before making a case, which at first is very flimsy and easily crumpled. When an older case is detached from a seed-head there generally comes away with it a silky continuation made from its mouth into the interior of the flower-head, apparently the lining of a tunnel formed between the various seeds of the separate flowers in the head.

"*C. laripennella.*—This species is found upon *Chenopodium*. The cases shown were of the immature form, very flimsy, composed of small pieces of the green seeds upon a thin silken base, very stumpy and wide open at both ends at first. After a while the anal end is drawn together in an irregular kind of opening without definite valves. At a later stage the case of this species has a much more substantial consistency and a more definite form.

"*C. cespititiella.*—One of our commonest species; a rush feeder. Those shown came from the Thames marshes, and were under water at each high tide. In meadows, hillsides,

etc., the cases found would have been much cleaner in colour, not having been subjected to the muddy water.

"*C. laricella.*—Several imagines, bred from the larvæ exhibited at the June meeting, are shown, together with a tuft of larch needles mounted to show (1) the depredations of the larvæ, (2) the hybernating case of the young larva (*in situ*), (3) the position of the larva and its case when feeding, and (4) the position of the case fixed at the base of the needles in the middle of the cluster during change of skin or for pupation. On the same mount are placed (1) a pupa to show the peculiar lengthening of the wing, antennæ, and leg-sheaths beyond the abdomen, a character common to all the members of the genus, (2) a case on a larch needle to show the obliquity of the mouth opening, and (3) cases to show the unusual method of making addition to the length and size, by which what was at first the back of the case becomes after the enlargement the under-side, and the mouth opening has its obliquity reversed. At the June meeting I exhibited the ova of this species, which had just been deposited. I passed these on to Dr. Chapman, and he has since described them; and Mr. Noad Clark, of Paddington Infirmary, has made some admirable photographs of them, which I now exhibit. (1) Four ova placed together, showing them to be 'upright' eggs, micropyle at the top, with only two diameters, and vertically ribbed, simulating at the first glance typical Noctuid eggs. These are magnified twenty diameters. (2) Two photographs of the crushed egg, to show the peculiar minute papillæ with which the whole surface is closely covered, and the arrangement of the micropylar cells. Magnified one hundred diameters.

"*C. vibicella.*—Imagines and cases of a rather local species, which, although generally distributed on the Continent, has only been recorded from a few English localities. Those exhibited came from Trench Wood, Worcester, and were taken about the year 1886."

Dr. T. A. Chapman remarked that the curious papillæ on the surface of the ova of *C. laricella* showed that they were in no way related to the Noctuid group, and he considered that the "upright" form had arisen from quite another line of development. Commander J. J. Walker said that he had met with

C. vibicella in the larval stage in some numbers at Chattenden a few years ago.

Papers.

Mr. Gilbert J. Arrow read a paper "On Sound-Production in the Lamellicorn Beetles."

Prof. Christopher Aurivillius, Hon. F.E.S., F.M.Z.S., communicated a paper on "New Species of African *Striphnopterygidæ*, *Notodontidæ*, and *Chrysopolomidæ* in the British Museum."

Mr. A. H. Swinton communicated a paper on "The Droughts and Weather, and Insect Increase and Migration."

Mr. E. Ernest Green communicated a paper on "Some New Mosquitoes from Ceylon," by Frederick V. Theobald, M.A.

Wednesday, October 19th, 1904.

Professor E. B. Poulton, D.Sc., M.A., F.R.S., President, in the Chair.

Election of Fellows.

Mr. Henry H. Brown, of the Procurator Fiscal's Office, and of Castleford Tower, Cupar, Fife, N.B.; Mr. George Eckford, of 3 Crescent Avenue, Plymouth; and Mr. W. Vaughan, of Denton Dene, Ealing, were elected Fellows of the Society.

Exhibitions.

Dr. T. A. Chapman exhibited a series of *Lozopera deaurana*, Peyr., bred last spring at Hyères, a species regarded as lost, or mythical, until he re-discovered it three years ago at Ile Ste. Marguerite, Cannes. He said that he was pleased to find it by no means rare at Hyères, as it was in imminent danger of extermination at Ile Ste. Marguerite, where the stems containing the pupæ are collected, to use for firewood apparently, more sedulously every year. Dr. Chapman also exhibited on behalf of Mr. Hugh Main a specimen of *Pieris brassicæ*, the anterior, and in a less degree the posterior, wings

of which had been symmetrically injured, probably by the girdle when in the pupal stage.

Mr. G. C. Champion exhibited specimens of *Nothorrhina muricata*, Dalm., from Las Navas, Spain, found trapped in the earthenware cups used to collect the exuding resin on the trunks of pines.

Mr. H. St. J. Donisthorpe exhibited specimens of the rare beetle *Cis bilamellatus*, Wood, taken at Shirley on October 10th last.

Mr. W. J. Lucas exhibited a ♀ specimen of the rare dragon-fly *Agrion armatum*. He said that a ♂ and a ♀ were taken in the Broads by Mr. F. B. Browne last year, and this year about ten more, probably all ♀ ♀, were taken in the same district. It is everywhere scarce. The late Mr. McLachlan had a pair sent him from abroad probably by Dr. Hagen; but besides these there are apparently no other examples in Britain. It is quite distinct from our other six blue Agrionines in form and colouring.

Mr. W. J. Kaye exhibited five specimens of *Dianthœcia luteago*, var. *ficklini*, from Bude, North Cornwall, taken during the first week of July 1901, and remarked that while the typical *D. luteago* of the Continent was tolerably constant, wherever it occurred in Britain it assumed a special local form. Thus on the east and south coasts of Ireland var. *barrettii* was found, and on the coast of North Wales a form rather similar to *barrettii* but differing in some respects, while the Cornish race was confined to var. *ficklini*.

Professor E. B. Poulton, F.R.S., exhibited a number of specimens of the genus *Sphecodes*, five species in all, and of their mimetic Tachinid fly, *Ocyptera brevicornis*, Loew, illustrating his remarks on Mr. Edward Saunders' paper on the Aculeate Hymenoptera from the Balearic Islands and Spain, published in the Transactions, 1904, pp. 644–649.

Mr. G. A. J. Rothney sent for exhibition a series of the Indian ant *Myrmicaria fodiens*, Jerdon (*subcarinata*, Smith), and communicated the following notes :—

"In the Proceedings of the Society, February 24th, 1892, iv, v, and also in the Transactions, March 1895, viii, 201–202, I have described at some length a colony of *Myrmicaria fodiens*

established in the big banyan tree in Barrackpore Park, from 1872 to 1894—twenty-two years,—and I am now able to add another ten years to its long tenancy, making thirty-two years up to July 1904. On my last trip to India in 1902 I was disappointed in not being able to visit Barrackpore, but last July two friends, Mr. Yapp and Mr. Cowdrey, after being well posted up with plans and specimens, had no difficulty in finding the colony in the old place and in a strong and flourishing condition. It seems possible that Myrmicaria will continue to reside in this tree as long as it remains.

"*Monomorium salomonis*, Lin., and *Solenopsis geminata*, Fab. In 'Notes on Indian Ants,' Transactions, March 1895, viii, I mentioned a paper merchant in Madras who encouraged these ants in his godowns as a protection against white ants—termites. Since that date my firm has opened a branch in Madras, and on a recent visit there in November 1902, I found the godown sircars—the natives in charge of the stock—had adopted the same plan and were fully convinced of its efficacy. Certainly on close inspection the go lowns were found wonderfully free from white ants in a strong white ant country. I found the above two species running about the godown floors in some numbers, also one or two other species which I did not identify."

Mr. Edward Saunders said he had made no observations as to the length of ant tenure in a single locality, but the Rev. F. D. Morice mentioned a colony which he knew to have existed at the same spot near Woking for the past twenty years.

Mr. E. E. Green exhibited a spider from Ceylon mimetic of some Coccinellid beetle, at present unidentified.

The President having remarked that spiders as a rule mimic ants alone, Mr. Green said it was the only instance of the kind he had come across; and that he had not found another example of the Arachnid in question.

Col. J. W. Yerbury exhibited specimens of the deer gadflies taken by him this year in Scotland, and read the following notes upon them:—

"During my sojourn in Scotland this year I was fortunate enough to capture two out of the three species of gadfly which

persecute the deer. As these insects are rarely to be seen in collections, I have brought them here to-night for exhibition, while, in order to make the exhibit more complete, I have, through the kindness of the President, obtained the loan of two specimens belonging to the Hope Museum, Oxford, of the third species.

"The specimens exhibited are as follows :—

"1. *Pharyngomyia picta*, Mg.—Though this species was undoubtedly taken in the New Forest by the old entomologists, it has now probably ceased to exist there, owing to the practical extinction of the Red deer in that locality. Whether it exists in the country of the Devon and Somerset staghounds is a question which still awaits elucidation. The specimens exhibited to-night are without doubt of German origin.

"2. *Cephenomyia rufibarbis*, Mg.—This species appears to be common at times in Scotland, for I was informed by one gentleman that he had seen as many as twenty specimens in one day in the Glenfeshie Forest. Personally, I have only met with six specimens, but, as these have been taken in almost the extreme vertical limits of its range, it may be as well to draw attention to the habits of the species under these different conditions. On the slope of Cairngorm it frequents the screes (steep slopes of loose stones), and slopes of decomposed granite, between the 3000 and 3500 feet contours, and there it rests basking in the hot sunshine. It should be observed also that to seek this insect other than during the brightest sunshine is labour thrown away! At Golspie, at a considerably lower elevation (*circa* 700 ft.), it was only met with flying over the heather, while to obtain it one was obliged to look out for a herd of deer, and then to get on the ground as soon as possible after the herd had vacated it. With luck a specimen might be caught flying over the heather, or might come and fly round oneself. It is, however, a method of collecting which entails a considerable amount of walking, and is real hard work, as it has to be carried on during the brightest sunshine. From our limited knowledge of these two species it appears as though *Pharyngomyia picta* is the Southern representative of this group of flies, while *Cephenomyia rufibarbis* is the Northern

one. It may be noted, however, that *C. rufibarbis* has only been recorded as British within the last few years; it is possible that, having established itself in this country, it is now ousting *Pharyngomyia picta* out of the field.

"3. *Hypoderma diana*, Brauer: the deer Warble fly.—A specimen of this species was taken some years ago in Braemar by the late Dr. Buchanan White, but has not since been met with. This year (from May 30th to June 4th) I found the species not uncommon in some five or six different localities in the Glenmore and Rothiemurchus deer-forests, while I also obtained a pair (♂ and ♀) at Golspie, making a total in all of 15 ♂♂ and 1 ♀. At Aviemore all the localities were between 1000 and 1200 ft. altitude, but further north, at Golspie, the places where the insect occurred were probably both under 700 ft. This species has much the same habits as the common Warble fly, *H. lineatum*, and sits basking itself on the forest roads, appearing to select dark-coloured spots to rest upon. Its time of flight too (after allowing for the difference of latitude) appears to be approximately the same; e. g. *H. lineatum* is common in Devonshire, and on the Black Mountain (*circa* 400 ft. elevation), Herefordshire, in the middle of May, about a fortnight earlier, or later, according to the particular year.

"The capture of the ♀ specimen alluded to above seems of sufficient interest to be recorded. A herd of deer were stalked in the hope of capturing a specimen of *C. rufibarbis*. This herd, instead of going straight away, broke back and 'ranked past by files' at a distance of 150 yards. Consequently I was on the ground passed over by the deer at once, and almost immediately caught a specimen of *C. rufibarbis*, while a minute or two later I found *H. diana*, ♀, sitting quietly on my knickerbocker stocking, and caught her with my hand. Although Brauer gives both the Red deer and the Roe as the hosts of this fly, I have some doubts about the correctness of that conclusion, and suspect that it confines its attention only to the former. On the other hand, Roe deer pelts obtained in Scotland are reported to be often warbled, so it is an interesting question as to what insect causes this injury."

Wednesday, November 2nd, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. E. A. Agar, of La Haut, Dominica, British West Indies; Mr. Richard Siddoway Bagnall, of the Groves, Winlaton-on-Tyne, Durham; Mr. Kenneth Gloyne Blair, of 23 West Hill, Highgate, N.; Mr. Edward Alfred Cockayne, B.A., of 30 Bedford Court Mansions, W.C.; Mr. George Blundell Longstaff, D.M., of Twitchen, Mortehoe, R.S.O., Devon, and Highlands, Putney Heath, S.W.; Mr. Richard Arthur Ruby Priske, of 66 Chaucer Road, Acton; and Mr. Herbert W. Simmonds, of 17 Aurora Terrace, Wellington, New Zealand, were elected Fellows of the Society.

Hall Testimonial.

The Treasurer announced that the sum of £40 had been already collected for a testimonial to Mr. W. R. Hall, late Resident Librarian, and intimated that he would be glad to receive further subscriptions.

Exhibitions.

Mr. J. E. Collin exhibited a specimen of *Platyphora lubbocki*, Verr., a species of Phoridæ parasitic upon ants. No specimen has been recorded since the one originally bred by the present Lord Avebury in 1875, and described for him by Mr. G. H. Verrall in the Journal of the Linnean Society for 1877. The example exhibited was caught by Dr. Wood of Tarrington, Hereford, at Stokes Wood, on July 6, 1904.

Mr. P. J. Barraud exhibited an aberrant *Epinephele jurtina* (*janira*), ♂, taken by him this year in the New Forest, agreeing with the form described by Mr. Roger Verity in the "Entomologist," vol. xxxvii, p. 56, as ab. *anommata*. The usual apical spots were absent from the fore-wings, giving the specimen a curious appearance, noticeable even when flying.

Mr. J. Edwards sent for exhibition three specimens of *Bagous lutosus*, Gyll., one found by himself on Wretham Heath, Norfolk, on August 4th, 1900—the first authentic

British example,—and two taken in the same locality by Mr. Thouless, on May 22nd, 1903; also *Bagous glabrirostris*, Herbst, from Camber, Sussex, for comparison.

Dr. T. A. Chapman exhibited bred specimens of *Hastula* (*Epagoge*, Hb.?) *hyerana*, Mill., from larvæ taken at Hyères last March, and said the fact that the pale forms only have hitherto been known, whereas of those bred nearly half are dark, suggests either that really very few specimens are in collections—which is the most probable case—or that melanism is now affecting the species. The larvæ are not uncommon at Hyères. Before he bred the species this year a single dark specimen only was known, viz. one taken by Lord Walsingham at Gibraltar, named by him *marginata* (MSS.), in doubt whether it was a var. of *hyerana*, or a new species. *H. hyerana* lives in *Asphodelus microcarpus*, and is interestingly parallel to, but very different from, *Tortrix unicolorana*, Dup., which feeds in various species of Asphodels, to which its ravages are beneficial, unlike the havoc caused by *hyerana*. *H. hyerana*, after spinning its cocoon in April, moults into an æstivating form of larva, of much the same colour as the moth, and this æstivating larva eats the cast larval skin, except the head, which it puts on one side and covers with some further silk. It remains quiescent all summer and pupates in July, August or September, emerging a few weeks later.

The larvæ of *Xanthandrus comotus* eat the larvæ (of which a number usually occur on one plant), following them into their tubes and burrows when the larva gives them a chance. As the fly emerges in April and May, it must have an alternative way of living over its next brood, as it is unlikely the flies live till late autumn, but as to the possibility of this, he had no knowledge.

Mr. J. W. Tutt remarked that the yellow type and this leaden form of this species found a parallel in the variation common to the Lithosiids, and noted that these two colorations occupy, in the latter group, dimorphic or sexual forms of variation. The fact announced by Dr. Chapman, that when the larva of *H. hyerana* had reached its full development it moults, and, without further feeding, rests for some time before undergoing the pupal moult at pupation, had only been

observed by him in connection with some of the Psychids, and the double moult at the end of the larval life was, therefore, very remarkable.

The President said that many years ago he had studied the young stages of *Smerinthus quercus*, and had found that the young larvæ, when entirely without food, would pass through the first stage, change their skins in an apparently normal manner, and thus enter the second stage. He attributed this power to the large amount of food material carried over from the store in the relatively immense eggs of this species.

Dr. Chapman said that all "plume" larvæ in the first instar appear to have a smooth skin, but after the first moult develop small spicules. Those of *Pterophorus lithodactylus* that hybernate within the ovum are spiculate on the first instar; it might be that the larva had undergone a moult in the egg-shell. The Lithocolletids sustain one or two moults without eating; in the case of *Acanthopsyche febretta* the probably hybernating larva changes in the autumn to a colourless maggot. The larva of *Scardia boleti* makes a cocoon and then throws off its skin, hybernating as a colourless white maggot, and it does not eat again before it pupates in the spring.

Mr. Tutt then said that the statement of Dr. Chapman led him to note that, some ten years ago, he had eggs of *Dryas paphia* which hatched in a tube and were left without food. These larvæ lived on into the winter without feeding. In looking over Buckler's *Larvæ*, etc., the other day he observed, p. 59, Buckler's remark that "the larva on its first appearance in spring is no more than $\frac{1}{8}$ inch long, having apparently moulted but once before hybernation." He wondered whether his observation was inaccurate, and queried whether *D. paphia* did moult before hybernation. It might of course, but did it moult without feeding? He had already recorded that the larva of *A. adippe* was actually formed and hybernated in the egg.

In further reply to Mr. Tutt, the President said that he also had observed that the young larvæ of *Dryas paphia* possessed the power of hybernating without taking food, and

he believed that this was the normal procedure. He remembered weighing the larvæ more than once in order to obtain some indication of the amount of waste which went on during the long months of starvation. He hoped at some future date to publish the record of his observations on these larvæ as well as those of *S. quercus*.

Colonel C. Swinhoe mentioned the case of some larvæ which he had brought home from Bombay, where, properly speaking, there was no such thing as hybernation. They left off feeding in the Red Sea in November, and on arrival in England hybernated. In the spring they pupated without feeding.

Mr. W. J. Kaye exhibited specimens of the moths *Castnia fonscolombei*, and *Protambulyx ganascus*, showing upper- and under-sides to illustrate how these species are coloured similarly on both the upper-side of hind-wing and the under-side of fore-wing. This was suggested as meaning that in flight, or in certain positions when at rest and suddenly alarmed, a maximum amount of warning coloration was exposed; while during such time as the insect was in complete repose all this colour was concealed, whether the assailant was viewing from in front or behind, both sides being exposed to view when these moths were hanging from a twig or leaf.

Mr. H. W. Andrews exhibited specimens of *Eristalis cryptarum*, F., and *Didea alneti*, Fln., two species of uncommon Syrphidæ from the New Forest.

Mr. Edward Harris exhibited a brood of *Hemerophila abruptaria* bred by him this season, together with the parent male and female; the female, a dark specimen, was taken in his garden at Upper Clapton, on May 25th, and the male, a normal type, at Ilford, on May 26th. Of the offspring, eighteen in all, eight were females, of which four were dark specimens and of normal size. Of the ten males five were dark specimens, darker than the females, but small even for males. They were smaller than the light specimens of the same brood. One of the light male specimens emerged with only three wings, the left fore-wing being absent. From dark specimens mated on August 12th fifty-seven larvæ had been reared.

The President read the following letter from Mr. G. A. James Rothney, but said he feared that at present there were

not sufficient data to form a conclusion on the points raised by the writer.

"Reading your very interesting paper on the mimicry of *Aculeata* in this year's Trans. Ent. Soc., III, pp. 661–5, reminds me that I have frequently wanted to inquire if any one has noticed that this form of mimicry is often extremely local and concentrated in character. In this way you may be out all day collecting and not find a single mimic—then you may light upon some spot where mimicking Diptera are common, even to the extent of each species of Aculeata having its under-study. I remember two places in India most distinctly —one a lane near Pulta Barrackpore, and the other the Khusru Bagh Gardens, Allahabad—where this was the case. In the last the mimicking Diptera were a perfect nuisance in collecting; for at that time this subject had not attracted the interest it has of late years. I cannot remember any particular feature which would make these two spots so particularly favourable for Diptera, and I do not think the explanation will be found in this direction. I have met with similar cases in other localities, but these two stand out as clearly-defined facts, and they have always puzzled me greatly."

Paymaster-in-Chief Gervase F. Mathew, R.N., exhibited a case containing some beautiful and interesting examples of *Leucania favicolor*, Barrett, including the varieties described by Barrett in the current volume of the "Entomologist's Monthly Magazine," p. 61, and, more recently, by Tutt in the "Entomologist's Record" for this year, p. 252. Thirty-nine examples were exhibited as follows :—

1– 2. The original pair as described by Barrett in the "Entomologist's Monthly Magazine" for 1896, p. 100. The genitalia of the male had been removed for examination by Mr. Pierce, so the specimen was rather spoilt.
3– 4. Male and female of typical form.
5– 8. Two males and two females ab. *obsoleta*, Tutt.
9–11. Two males and one female ab. *intermedia*, Tutt.
12–14. Two males and one female ab. *intermedia-typica*, Tutt.
15–17. One male and two females ab. *argillacea*, Tutt.
18–21. Two males and two females ab. *rufa*, Tutt.

22–24. Two males and one female ab. *rufa-typica*, Tutt.
25–27. Two males and one female ab. *lutea*, Tutt.
28–29. One male and one female ab. *lutea-typica*, Tutt.
30–31. Two males with fore-wings flushed with a beautiful rosy tint, and hind-wings with veins conspicuously shaded with smoky-brown. These two were bred from ova laid by a female of ab. *lutea*.
32–34. One male and two females of a smoky-cinnamon.
35. One male deep orange with smoky hind-wings ; a remarkable variety.
36–39. Two males and two females of a dirty cream, faintly flushed with pink, and with pale rosy fringes to fore-wings.

N.B.—The species varies excessively, and the different shades of colour are difficult to describe.

Mr. Mathew also exhibited a series of twenty-four *Camptogramma fluviata*, the descendants of a wild pair captured on September 22nd, 1903. The female laid a batch of eggs which began to hatch October 2nd, and the moths emerged during the middle of November, and from these more ova were obtained and successive broods were reared during January, April, June, and August, after which date no further attempts were made to continue the brood, as the imagines were becoming undersized, and of the last brood but a very small proportion of the pupæ produced moths. The specimens were contained in a small exhibition-box, and were arranged in four rows as follows :—

1st row. Six males with broad dark brown central fascia.
2nd row. Two males with broad dark brown fascia and conspicuous pearl-grey margins.
One male with central fascia broken.
Two males with central fascia nearly obsolete.
One male of a warm reddish-brown, central fascia very faint, and with pearl-grey margins.
3rd row. Three typical females.
Three females of a claret colour, with conspicuous dark fascia.
4th row. Three females sepia-brown, with conspicuous white discal spots in the centre of dark fascia.

Three females with conspicuous pearl-grey margins.

Commenting on the above exhibits, Mr. J. W. Tutt said that *Leucania favicolor* was entirely restricted to our east coast regions, possibly in a somewhat similar local area to *Leucania brevilinea*, which was confined also to our eastern coast, except for a record in Holland, but only in very small numbers. It would probably be found to have a very fair range on our eastern seaboard, being recorded from Dovercourt, Shoebury and Strood, while in colouring it showed as fine a range of variation as any other species of the group. Mr. Mathew had found the species partially double-brooded, but probably many of our "wainscots" produce a certain number of individuals in the form of a second brood.

The President exhibited a photograph taken by his assistant, Mr. A. H. Hamm of the Hope Department, Oxford, and communicated the following note, in which Mr. Hamm records his observation :—

"On the evening of the 8th of August last while looking over some Cactus Dahlias growing in my garden, I found a ♂ *Pieris rapæ* at rest on the petals of a pure white variety, and immediately photographed it *in situ*, as shown in the print exhibited.

"Again, on September 1st, in the evening, another ♂ of the same species was found at rest in an almost identical position on the same plant.

"And for the third time, on October 8th, yet another ♂ of *P. rapæ* was found at rest in a similar position on the same plant. The day succeeding October 8th was dull and chilly, and the butterfly remained without moving the whole day. In the evening of the 9th it was in exactly the same position as that occupied on the evening of the 8th.

"I had in all some thirty plants of Cactus Dahlias varying in colour from very dark purple-red to red, pink, mauve, orange and yellow ; but only two plants which were pure white. On no single occasion did I observe *P. rapæ* at rest on any other flower or plant than the one mentioned.

"This, I think, is very significant and emphasizes the fact that some insects do discriminate between colours in choosing a resting site, and that in the direction of protective resem-

blance. Otherwise why should *P. rapæ* on each occasion have chosen the white flower in preference to those of other colours in such close proximity?"

Dr. T. A. Chapman mentioned that he had once followed a specimen of *Colias edusa* for a considerable distance, and observed that it invariably came to rest upon a yellow leaf.

The President also exhibited four specimens of *Conorrhinus megistus*, Burm., a large South American Reduviid of a genus which is well known to attack man. These four examples were a few out of over three dozen brought back by W. J. Burchell, and the notes upon them are an interesting record of his experience of the habits of the insect. All four were captured in the year 1828, and they bear labels as follows:—

(1) "22. 1. 28. This species I have generally found in my bedroom, and this individual in my bed."

(2) "26. 5. 28. In cubiculis et in lecto ipso."

(3) "II 4. 6. 28. In lecto. Its body filled with red blood, sucked from the human body as the common *Cimex lectularius*."

(4) "14. 6. 28. *Percebéjo paulista*."

All these labels except the second were written by Burchell in Brazil during his residence at Goyaz (Nov. 3, 1827 to Aug. 21, 1828). In the case of the second the original label had been replaced by another carefully written by Burchell after his return to England.

The fourth label suggests a local name, which, however, Burchell discredited in the following paragraph in his Brazilian note-book. It is to be observed that the note refers to a specimen taken three weeks later than No. (4). "1235. Cimex. The name *Percebéjo paulista*, if applicable to any, would be given to *C. lectularius*, but this name was a mere extempore invention by the person who gave it me. The present Cimex is here commonly called *Percebéjo cascúdo*." The note is undated, but the date "4. 7. 28" accompanies No. "1235" on the specimen.

Don Fernando de Arteaga has kindly interpreted the Portuguese words. "Persevejo," as it should be spelt, means "bug," while "Paulista," apart from various meanings derived from St. Paul, bears, colloquially, the figurative significance

of "obstinate" or "pig-headed." "Cascudo" means "with a thick shell," and figuratively "of a rough exterior." It is probable that the word is here used in the latter sense.

Burchell's specimens (2) and (3) are represented below.

Natural size.

Two specimens of *Conorrhinus megistus*, Burm., together with the labels which accompany them.

Commander Walker has directed my attention to Darwin's account of another species of the same genus which he encountered only a few years later than Burchell, but in a very different part of the continent. This species, probably *C. infestans*, Klug., was spoken of as the Benchuca. Darwin's interesting record is as follows:—"At night [at Luxan, near Mendoza, Mch. 26, 1835] I experienced an attack (for it deserves no less a name) of the *Benchuca*, a species of Reduvius, the great black bug of the Pampas. It is most disgusting to feel soft wingless insects [Darwin probably refers to the immature stages], about an inch long, crawling over one's body. Before sucking they are quite thin, but afterwards they become round and bloated with blood, and in

this state are easily crushed. One which I caught at Iquique (for they are found in Chile and Peru,) was very empty. When placed on a table, and though surrounded by people, if a finger was presented, the bold insect would immediately protrude its sucker, make a charge, and, if allowed, draw blood. No pain was caused by the wound. It was curious to watch its body during the act of sucking, as in less than ten minutes it changed from being as flat as a wafer to a globular form. This one feast, for which the benchuca was indebted to one of the officers, kept it fat during four whole months; but, after the first fortnight, it was quite ready to have another suck." ("Journal of Researches, etc." London, 1876, p. 330.)

Wednesday, November 16th, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of a Fellow.

Mr. Edward Goodwin, of Canon Court, Wateringbury, Kent, was elected a Fellow of the Society.

Nomination of Officers and Council.

Mr. H. Rowland-Brown, one of the Secretaries, announced that the Council had nominated the following Fellows to serve as Officers and Members of the Council for the year 1905 :—

President, Mr. Frederic Merrifield; Treasurer, Mr. Albert H. Jones; Secretaries, Mr. Henry Rowland-Brown, M.A., and Commander James J. Walker, R.N., F.L.S.; Librarian, Mr. G. C. Champion, F.Z.S. Other Members of Council, Mr. Gilbert J. Arrow, Colonel Charles T. Bingham, F.Z.S., Dr. Thomas A. Chapman, M.D., F.Z.S., Mr. James E. Collin, Dr. Frederick A. Dixey, M.A., M.D., Mr. Hamilton H. C. J. Druce, F.Z.S., Mr. Herbert Goss, F.L.S., Mr. William J. Lucas, B.A., Professor Edward B. Poulton, M.A., D.Sc., F.R.S., Mr. Louis B. Prout, Mr. Edward Saunders, F.R.S., and Colonel John W. Yerbury, R.A., F.Z.S.

Vote of Thanks.

The Treasurer having announced that the next of kin of the late Mr. R. McLachan, F.R.S., were desirous of presenting the Society with books to the value of £100 from the library of the deceased Fellow, a vote of thanks was unanimously passed them.

Exhibitions.

Mr. H. St. J. Donisthorpe exhibited the second recorded British specimen of *Orchestes sparsus*, Fahr., taken by him on August 28th last in the New Forest.

Mr. H. W. Andrews exhibited specimens of *Atherix crassipes*, Mg., from the New Forest, the only previously recorded locality in Britain being near Ticehurst, Sussex.

Mr. G. O. Sloper exhibited two aberrant forms of *Melitæa athalia*, ♂ and ♀, from Luan, above Corbeyrier, Switzerland, and one ♂ from Martigny, taken on June 26th this year. The tendency of the black markings to supersede the fulvous was particularly noticeable in the latter specimen.

Mr. C. O. Waterhouse exhibited a gall of some Lepidopterous insect found on the Calafate bushes in Patagonia. The gall resembled that of *Cynips kollari*, but was hollow, the walls being about $\frac{1}{8}$ inch in thickness. The circular door prepared by the larva was about $\frac{1}{5}$ inch in diameter. The pupa was lying free, without any silk cocoon. It was suggested that the insect was perhaps allied to *Œcocecis*.

The President exhibited the Diptera of W. J. Burchell's British collection, and said that he was indebted to the kindness of Colonel J. W. Yerbury, Mr. G. H. Verrall, and Mr. J. E. Collin for the determinations. The chief interest of the collection lay in the large proportion of specimens taken in the garden of Churchfield House, Fulham; the great age of many examples, some dating back over 100 years; the remarkably full and precise data characteristic of this exact and keen observer; and the light thrown upon the movements of the great naturalist, who, after his return from Brazil in 1830, became one of the most isolated and mysterious figures in the roll of British science.

The PRESIDENT also exhibited seven skins of African caterpillars preserved by W. J. Burchell during his travels. They were as follows :—

(1) An unknown species of *Papilio* bearing the data "16.3.15. Pascitur in foliis *Umbelliferæ dendrophyllæ* affinis. v. H." Burchell was at "Nieûw Kloof Station" on March 16, 1815. "v. H." means "vide Herbarium." Burchell's Herbarium is now at Kew.

(2) The yellow and green form of *Acherontia atropos*, apparently full-fed. "22.12.14. Folia caulesque '*Solani tuberosi*' editur *Sphynx Atropos*? S. N." The last two letters refer to the "Systema Naturæ." The locality was "Krombeks-river Station."

(3) *Celerio lineata livornica*, probably nearly full-fed. The skin was kindly compared by Dr. Karl Jordan with specimens of this species in the Tring Museum. No data accompany this preparation.

(4) A green Chærocampid larva. "28.11.14." The species cannot at present be determined. The locality was "Mountain Station."

(5) A brown Chærocampid larva which Dr. Jordan thinks may be *Theretra cajus cajus*, Cram. "7.12.14." This and (4) are on one piece of paper and from the same locality. Both are probably nearly mature.

(6) An unknown Lasiocampid larva. "9.12.14. In montibus altis. *Restiones* varios, inter quos *R. giganteus*, edit. Penicillis in dorso lilacinis." This and (2) on the same piece of paper. Burchell was at "Mountain Station" on Dec. 19, 1814.

(7) An unknown larva which Dr. Jordan and Sir George Hampson believe to be a Lasiocampid. "20.10.14." The locality at this date was Mossel Bay.

All the above localities are in the south of Cape Colony between Mossel Bay and Cape Town, "Mountain Station" and "Krombeks-river Station" being to the N.E. of St. Sebastian's Bay. The former is in the Lange Berge, and Burchell determined its latitude as 33° 58′ 14″ S.

The method of preservation now so abundantly justified by the persistence of larval pattern and colouring for ninety

years, is carefully described in "Travels in the Interior of Southern Africa" (vol. i, pp. 469—473. London, 1822). Burchell much wanted to preserve a large Puff Adder which had been killed near Klaarwater, on Nov. 19, 1811, by one of his Hottentots. In the absence of bottles, kegs, and spirits, "the idea was at last imagined of drying the skin, on the same principle, and in the same manner, as would have been done with a large leaf. . . . The whole process was extremely simple, and consisted merely in cutting it open, along the under part, entirely from the head to the point of the tail, and stripping off the skin, which was found to separate with the greatest facility. All the flesh was cut away as closely as possible to the head, which was left entire. The skin was then spread flat on a sheet of large strong paper, and placed between a number of other sheets to absorb the moisture. It was put into the press, leaving the head out so as not to be crushed, and kept there till perfectly dry; taking care every day, or every other day, to remove the sheets that had become damp, and replace them by an equal quantity of dry paper; but the skin itself was never separated from that sheet to which its inner side had adhered. . . . The skin requires no antiseptic preparation, nor any varnish to be applied to it: nor is any gum, or paste, at all necessary for making it adhere to the paper; a certain glutinous property of its own being sufficient for that purpose. . . . The paper used for this purpose was a strong white cartridge-paper, . . . The most convenient mode of applying the skin to the paper, is by the assistance of a short roller, or cylinder, held in the hand, and on which the skin and paper are gradually rolled. By these means, only one part of the skin coming on to the paper at one time, the due stretching and placing of it is managed with the greater exactness: . . . I ought not in this place to omit mentioning, that, on an occasion, about a year later, when one of my Hottentots brought me a large *caterpillar*" [this may be No. 3, the specimen of *livornica*, without data], "the colours of which were exceedingly beautiful, and its delicate marks beyond the power of imitation, I was induced to try the experiment of preserving it in the manner I had adopted for the serpents.

In this I met with exactly the same success; and which was afterwards fully confirmed by several other trials." [The six larvæ with data, Nos. 1, 2, and 4—7, are evidently referred to here.] "But as the time required for making a collection of these, must have been taken from other affairs of more importance, and as the possession of insects in the caterpillar state only, would have been of little use to science, and merely amusing curiosities, I collected very few objects of that kind. This hint may, perhaps, be the more valuable, as many difficulties have been found hitherto in the art of preserving the larvæ with their natural colours; a desideratum which this method will accomplish, if ten years be considered sufficient for proving their permanency."

Papers.

Mr. G. H. Kenrick communicated a paper entitled "Natural Selection applied to a Concrete Case."

Mr. J. C. Kershaw communicated papers on "Enemies of Butterflies in South China," and "A Life History of *Gerydus chinensis*."

Mr. Nelson Annandale, B.A., Deputy Superintendent of the Indian Museum, Calcutta, communicated a paper on "The Eggs and Early Stages of a Coreid Bug, probably *Dalader acuticosta*, with a note on its Hymenopterous Parasites."

Wednesday, December 7th, 1904.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. Horace A. Byatt, B.A., of the Colonial Office, and Mr. J. C. Winterscale, F.Z.S., of Karangan, Kedah, Penang, Straits Settlements, were elected Fellows of the Society.

Nomination of Officers and Council.

Mr. H. Rowland-Brown, one of the Secretaries, read the list of Fellows recommended for Election as Officers, and to

serve on the Council for the ensuing year, and there being no additional Fellows proposed, they were duly nominated.

Obituary.

The President announced the death of Mr. W. R. Hall, late resident Librarian of the Society, and the meeting passed a vote of sympathy with the family of the deceased, the Treasurer being authorized to pay over to the widow the balance of the testimonial fund in his hands.

Exhibitions.

Mr. M. Jacoby exhibited specimens of a new species of *Sagra*, *S. humeralis*, Jac., from Tonkin.

Mr. H. St. J. Donisthorpe exhibited *Quedius nigrocæruleus*, taken by Mr. H. C. Dollman in a rabbit-hole at Ditchling, Sussex, this being the fourth recorded British specimen.

Professor T. Hudson Beare exhibited a specimen of *Tetropium castaneum*, L., one of the Longicorns recently introduced into our list. The specimen was taken at Hartlepool some years ago by Mr. J. Gardner, and was probably introduced, as it was found in the neighbourhood of the quays, where large shipments of pit props are being discharged continually.

Mr. G. J. Arrow exhibited on behalf of the Hope Collection, and in illustration of his paper read Oct. 5 last, a series of specimens of Passalidæ collected by Burchell in Brazil, and read the following observations, found by Prof. Poulton among the MS. note-books of this traveller and referring to these specimens:—"1142. Passalus. Found under large chips of wood in the forest. In the manner of Carabi, but it does not run a fourth so quickly. Judging from large holes in these chips, its larvæ are bred there. On taking it in the hand, it makes a faint [sound] between a hissing and a squeaking; like the Lamiæ." Dec. 9, 1826. At Rio las Pedras, Cubatão. This is by far the earliest record of the possession by these beetles of vocal powers, the instruments of which have only recently been discovered by Mr. Babb of Massachusetts.

Mr. Arrow called attention to the remarkable fact that the

six specimens exhibited, although apparently all found at the same time and place and supposed by Burchell to be of one species, actually consisted of no less than five species of three genera. Dissections were also shown illustrating the means by which the sound is produced in the Passalidæ.

Mr. C. O. Waterhouse exhibited five drawings illustrating the development of the front-wing in the pupa of the Tusser Silk Moth, showing the relation of the tracheæ to the veins. These were prepared for exhibition in the Natural History Museum, and were made from the specimens exhibited at the Society's meeting in February 1896. (*See* Proc. Ent. Soc. 1896, p. ii.)

He also exhibited some coffee berries from Uganda injured by a small beetle belonging to the *Scolytidæ*. The beetles laid their eggs in the berries when young and green. The mature berries were often found with little of the inside left.

Mr. Waterhouse further exhibited two Coleopterous larvæ from the Burchell Collection from Brazil, submitted to him for determination by Prof. Poulton. One was a Heteromerous larva (numbered 1154) two inches long, much resembling the larva of *Helops*. The more interesting one (numbered 1330) was noted by Burchell to be luminous. It was one inch in length, subcylindrical, and appeared to be the larva of an Elaterid, but the prothorax was unusually large, and the head retracted beneath; the mouth parts, although not those of a typical Elater, conformed more to that type than to any other with which he was acquainted.

In connection with Mr. Waterhouse's exhibits the President contributed the following notes:—"1154" is attached not only to the larva but also to the Anthribid *Ptychoderes elongatus*, Germ. The note is as follows:—"1154. Cut out of dead wood but not quite perfected. The long cylindric larva of this number was said to be cut from the same piece of wood and therefore may be the same insect." Dated Dec. 17, 1826. Locality, Cubatão; between the "Middle Part" (Dec. 16) and the "Upper Part of the ascent" (Dec. 22) of "the great range of mountains," the Sierra da Cubataõ.

"1330. Larva of (*Lampyris*?). Caught in the garden

crawling on the ground at night, and detected by means of a small spot of light at the head; but on being touched it instantly emitted a much stronger light from every part or joint of the abdomen, which previously was quite dark. The light proceeded only from the under part: the back was dark at all times." The date was March 1, 1829, and the locality Porto Real (now Porto Naçionale) on the River Tocantins. The observation is quoted in Ann. and Mag. Nat. Hist., 1904, xiii., p. 100, where, however, it is assumed that the larva, which had not then been found, was a Lampyrid. Burchell thought that the larva was probably that of "1334," a Lampyrid (taken on March 2, 1829) identified by Monsieur Jules Bourgeois as *Photuris lineola*, Blanch.

Commander J. J. Walker exhibited the type-specimen of *Haplothorax burchelli*, G. A. Waterhouse, from the Hope Collection, Oxford University Museum. This very remarkable Carabid was discovered by the celebrated South African traveller, W. J. Burchell, in St. Helena. It is now exceedingly rare in its sole locality, the late Mr. Wollaston, during his visit to the island in 1875–6, having entirely failed to find the beetle alive, though its dead and mutilated remains were often met with. Described Trans. Ent. Soc. III. p. 207, plate XII, f. 1.

The President exhibited cases showing the results of recent breeding experiments upon *Papilio cenea* conducted at Durban by Mr. G. F. Leigh, who had for the first time bred the form *trophonius* from *trophonius* itself. Mr. Leigh had watched a *trophonius* laying eggs, and, although he failed to catch the parent, a considerable number of eggs were obtained These produced males, females of the *cenea* form, and a single *trophonius* female. A careful comparison of the whole synepigonic group would be presented to the Society at a later date. Adding this result to the records published in Mr. Leigh's paper in Part IV. of the Transactions (1904, p. 677), it will be found that the form *cenea* has produced *cenea* and a small proportion of *hippocoonoides*, while the form *trophonius* has produced *cenea* and a small proportion of *trophonius*. *Hippocoonoides* has not yet been bred from *trophonius*, nor has *trophonius* from *cenea*. *Hippocoonoides* has not been bred

from at all. Much remains to be done, but Mr. Leigh's work marks a great advance in our knowledge of this most interesting of mimetic forms.

The PRESIDENT showed a long series of *Crastia amymone*, captured by Mr. J. C. Kershaw at Macao. The series exhibited a beautiful transition between typical *amymone*, Godt., and *godarti*, Lucas, the lavender apical patch on the fore-wing first appearing as a minute trace in certain individuals, gradually becoming larger in others. Similar transition occurred in the development of the white marginal spots of the hind-wing. Mr. Heron had noticed intermediate forms between these two Euploeas about ten years ago, and had arranged them in the collection of the British Museum as possible hybrids between *godarti* and *felderi*, Butl. (= *amymone*). Among the three specimens thus arranged was one captured by Commander J. J. Walker in May, 1892. Mr. Kershaw's results throw new and unexpected light on the subject; for not only has he shown the gradual transition, but he has even succeeded more than once in breeding well-marked individuals of the one form from well-marked individuals of the other. He also states the larvæ eat the same food-plant, and are exactly alike, as also are the pupæ. After this evidence there can be no doubt that we are dealing with a single species, and *godarti* becomes a subspecific form of *amymone*. It is hoped that on some future occasion parent and offspring will be shown to the Society, and represented in one of the plates of the Transactions. The speaker expressed the opinion that Mr. Kershaw's observation was one of those important pieces of work which opened the way to a great deal more. He believed that there was no group in which such work is more wanted than in the Euploeina.

The PRESIDENT also exhibited a photograph, taken by Mr. Alfred Robinson of the Oxford University Museum, showing the Xylocopid model and its Asilid mimic exhibited by Mr. E. E. Green at the meeting of June 1 (Proc. Ent. Soc. Lond. 1904, p. xxxix). The example was particularly interesting, inasmuch as Mr. Green's record of the mimic circling round its model tended to support the view that the bee is the prey of the fly. (*See* Trans. Ent. Soc. Lond. 1904, pp. 661–663.)

Mr. Robinson's photograph of model and mimic is reproduced below.

Papers.

Dr. T. A. Chapman read a paper on *Erebia palarica*, n. sp., and *Erebia stygne*, chiefly in regard to its association with *E. evias*, in Spain.

The object of the paper was to bring together our knowledge, still rather fragmentary, of how *E. stygne* and *E. evias*, starting as it were from the Pyrenees, could be traced west into the Cantabrian Sierra, then south to the Sierra, east of Burgos, and further south to the Guadarrama (at La Granja).

Xylocopa fenestrata, F. *Hyperechia xylocopiformis*, Walk.

(*Natural size.*)

How they were in each locality modified so as to closely resemble each other, and were, varying together, more modified as we went further from the Pyrenees. Beyond the Guadarrama, the two species had not been found together; but to the west was found an extremely modified *Stygne* (at Bejar) and to the east an extremely modified *Evias* (in the Albarracin district). In most of these localities an unmodified form of *Erias* occurred at a lower level, and about six weeks earlier in date.

The paper also described *Erebia palarica*, a new species from the Cantabrian range, first taken by Mrs. Nicholl in 1902. It superficially resembles *E. æthiops*, but is nearer to

E. stygne, of which it appears to be phylogenetically a recent offshoot. It is the largest and one of the most brilliant species of the genus.

Longer or shorter series of nearly all the forms referred to were exhibited.

Dr. G. B. Longstaff gave an account of his entomological experiences during a tour through India and Ceylon, October 10, 1903, to March 26, 1904. A main object had been to make bionomic observations on common butterflies. The specimens taken had been placed in the Hope Collection at Oxford.

He summarized the results of his observations, illustrating his remarks by exhibiting some of the insects referred to.

Omitting more doubtful cases, 32 specimens of 28 species exhibited what he took to be injuries inflicted by birds or lizards. Among them were two *Tirumala septentrionis* and two Papilios with conspicuous red warning marks, but no *Limnas*.

Three Satyrids, *Mycalesis indistans*, *Hipparchia parisatis*, and *Aulocera swaha*, had been observed to adopt a sideways attitude when at rest, especially when in full sunshine. He had moreover confirmed the like observation of E. H. A., "A Naturalist on the Prowl," in the case of *Melanitis ismene*. He stated that Dr. Dixey and he had observed a like habit in several English Satyrids, notably *Satyrus semele*. He pointed out that if the insect leaned towards the sun its shadow would be materially diminished, and it would be to that extent protected, since the shadow was often more conspicuous than the insect itself. He had some reason to believe that *Pararge shakra*, which sits upright, prefers to have its back to the sun, and so reduce its shadow to a mere line.

Many specimens had been examined during life to ascertain whether they had a scent perceptible to the human nose. In spite of the numerous difficulties he had come to certain conclusions.

He had confirmed Wood Mason's statement as to a jasmine-like scent in certain male *Catopsilias*.

A group of Pierines comprising *Ganoris rapæ*, *G. canidia*,

Huphina nerissa, *Belenois mesentina*, *Catophaga paulina*, and *Delias eucharis*, all had a scent very suggestive of that of sweet-briar. It was probably confined to the male sex.

A smaller group of Pierines, comprising *Ganoris napi*, *G. oleracea*, and *G. melete*, had a strong and very characteristic scent reminding one of lemon-verbena. It was certainly confined to the male sex.

On the other hand, *Ganoris brassicæ* has a scent of its own, somewhat like violet-powder. Thus three species in one genus had distinct scents, but of these one was shared by many widely-spread genera. He believed that when more was known of these scents they might prove of considerable philogenetic value.

Several Danaids, viz. *Crastia core*, *C. asela*, *C. amymone* (at Macao), *Isamia midamus* (at Hong Kong), *Parantica ceylonica*, and *Chittira fumata*, all had a strong odour like acetylene.

Limnas chrysippus had a faint odour like cockroaches or musk-rats. He was unable to say whether these Danaine scents were confined to the male sex, although he believed it to be the case.

His observations on seasonal forms were to the effect that the forms of *Precis* agreed closely with wet and dry conditions, but this was not so in the case of either *Catopsilia pyranthe* or *Terias hecabe*.

He called attention to the fact that the anal lobe of certain Lycænids is set at right angles to the hind-wing; a fact usually lost in cabinet specimens by the results of setting. By specially set specimens and drawings taken from the living butterfly he showed that this structure, together with the tails, produced the appearance of a head and antennæ, and was probably protective.

In conclusion he showed by the lantern, photographs of some of the localities visited.

ANNUAL MEETING.

January 18th, 1905.

Professor Edward B. Poulton, M.A., D.Sc., F.R.S., etc., President, in the Chair.

Mr. Robert W. Lloyd, one of the Auditors, read the Abstract of the Treasurer's accounts, showing a balance in the Society's favour of £18 15*s.* 5*d.*

Mr. Herbert Goss, one of the Secretaries, read the following

Report of the Council.

During the Session 1904–1905 five Fellows have died, viz. one Hon. Fellow, Professor Brauer, and four Fellows, Mr. Charles G. Barrett, Mr. R. McLachlan, F.R.S., Mr. E. G. Sparke, and Mr. W. F. Urwick; seven Fellows have resigned, or have been struck off the list, and thirty-two new Fellows have been elected.

As was the case last year, the number of Fellows who have died is below the average, as is also the number of those who have resigned, or have been struck off the list; whilst the number of new Fellows (thirty-two) is nine in excess of the number elected last year. In very few years, if any, of the Society's existence, have thirty-two Fellows been elected in one year. It is hoped that the Fellows will continue their efforts to secure a considerable addition to the Society's list of members, and to promote its increasing prosperity.

At present the Society consists of eleven Honorary Fellows, and four hundred and ninety-two Life and Subscribing Fellows, making a total of five hundred and three, which, notwithstanding the losses by death, resignations and exclusions, is an increase by eighteen on last year's list, and represents a membership greater than in any previous year of the Society's existence of seventy-one years.

The Transactions for the year 1904 form a volume of 750 pages, containing twenty-seven Memoirs, contributed by the following authors: Mr. Gilbert J. Arrow, Professor Christopher Aurivillius, the late Mr. Frederick Bates, with an introduction

by Mr. Arrow, Mr. Malcolm Burr, Mr. Peter Cameron (two papers), Mr. George C. Champion and Dr. Thomas A. Chapman, Dr. T. A. Chapman, Mr. William L. Distant, Mr. Frederick P. Dodd, Mr. William J. Kaye, Mr. Percy I. Lathy (two papers), Mr. Arthur Lea, Mr. George F. Leigh with notes by Professor Poulton, F.R.S., and an Appendix by Mr. Roland Trimen, F.R.S., Major Neville Manders, Mr. Kenneth J. Morton, Mr. Frederick Muir and Dr. D. Sharp, F.R.S., The Rev. Francis D. Morice, Mr. Edward Saunders, F.R.S., and Professor Poulton, F.R.S., Mr. Robert W. C. Shelford with a note by Col. Charles T. Bingham, Col. Charles Swinhoe (two papers), Mr. Roland Trimen, F.R.S., Dr. A. Jefferis Turner, Mr. Gustavus A. Waterhouse, and Captain Charles E. Williams.

Of these twenty-seven papers, four relate to Coleoptera, two to Hemiptera, four to Hymenoptera, one to Neuroptera, two to Orthoptera, and thirteen to Lepidoptera. In addition there is a paper which cannot be identified with any one order of insects, viz. Mr. Champion's paper entitled "An Entomological Excursion to Moncayo, North Spain," which, in addition to an account of Mr. Champion's travels with Dr. Chapman, contains lists of his captures of *Coleoptera and Hemiptera-Heteroptera* in Spain.

It is to be regretted that no papers on Diptera and only one on Neuroptera have been published during the year, but it is satisfactory to have published many papers relating to Coleoptera, Hemiptera, Hymenoptera, Orthoptera and Lepidoptera.

The Memoirs above referred to are illustrated by thirty-six plates, of which ten are coloured. The greater part of the cost of Plates VI, VII, VIII, and IX was borne by the Rev. F. D. Morice. The cost of Plate X was entirely defrayed by Mr. Herbert Adams and Mr. Percy I. Lathy, and Mr. Lathy also contributed half the cost of Plate XXVII. The entire cost of Plates XI, XII, XIII, XIV, XV, and XVI has been defrayed by Dr. T. A. Chapman. The sum of £20 was contributed by Mr. Feltham, through Mr. Trimen, towards the cost of Plates XIX and XX, and Professor Poulton, F.R.S., has paid half the cost of the blocks for Plates XXXI and XXXII.

The interest shown by the Fellows during the past year by their exhibitions and discussions has enabled the Secretaries to treble the Reports of the Proceedings, which up to the present date extend to nearly one hundred pages, and thus compare very favourably with those for any previous year of the Society's existence.

During the past year nineteen volumes—in addition to periodicals, pamphlets and reprints—have been added to the Society's Library. The increased use of the Library is proved by the fact—according to the Resident Librarian's Report—that two hundred and seventy-four volumes have been borrowed by Fellows during the year; and in addition nearly as large a number of books have been used by Fellows in the Library.

The Treasurer reports that after carrying forward to 1905 the sum of £7 7*s.* for subscriptions paid in advance in 1904, and investing £47 5*s.* for three Life Compositions received during the year, making the total sum so invested £792 3*s.*, there remains a genuine cash balance in the Society's favour of £18 15*s.* 5*d.* The accounts compare favourably with those of last year. Under the heading of "Receipts" the total this year is slightly in excess, the smaller balance carried forward is in consequence of numerous subscriptions, amounting to upwards of £50, being in arrear. The majority of these however are considered as likely to be paid in time. On the whole the financial position is perfectly satisfactory, and the Fellows have to be congratulated on the increased, and still increasing prosperity of the Society.

Entomological Society,
11, Chandos Street, Cavendish Square, W.
18*th January*, 1905.

The Secretaries not having received any notice proposing to substitute other names for those contained in the list prepared by the Council, the following Fellows constitute the Council for 1905-1906: Mr. Gilbert J. Arrow; Lt.-Colonel Charles Bingham, F.Z.S.; Mr. George C. Champion, F.Z.S.; Dr. Thomas A. Chapman, M.D., F.Z.S.; Mr. James Edward

Collin ; Dr. Frederick A. Dixey, M.A., M.D. ; Mr. Hamilton H. C. J. Druce, F.Z.S. ; Mr. Herbert Goss, F.L.S. ; Mr. Albert Hugh Jones ; Mr. William John Lucas, B.A. ; Mr. Frederic Merrifield ; Professor Edward B. Poulton, M.A., D.Sc., F.R.S. ; Mr. Louis B. Prout ; Mr. Henry Rowland-Brown, M.A. ; Mr. Edward Saunders, F.R.S., F.L.S. ; Commander James J. Walker, R.N., F.L.S. ; and Colonel John W. Yerbury, R.A., F.Z.S.

The following are the Officers elected : *President*, Frederic Merrifield ; *Treasurer*, Albert Hugh Jones ; *Secretaries*, Henry Rowland-Brown and Commander James J. Walker ; *Librarian*, George C. Champion.

The Balance Sheet and Report having been unanimously adopted, Professor Poulton, the President, delivered his Address. A vote of thanks to the President for his Address and to him and the other Officers for their services was moved by Professor Meldola, F.R.S., and seconded by Mr. Verrall. Professor Poulton, Mr. Herbert Goss, Mr. H. Rowland-Brown, and Mr. Albert H. Jones replied.

ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1904.

Receipts.	£	s.	d.
Balance in hand, 1st Jan., 1904	47	2	7
Subscriptions for 1904	380	2	0
Arrears	13	13	0
Admission Fees	44	2	0
Donations	42	0	10
Sales of Transactions, etc.	106	15	5
Interest on Investments:—			
Consols £18 4 4			
Westwood Bequest 6 16 10			
	25	1	2
Subscriptions in advance	7	7	0
Life Compositions	47	5	0
	£713	9	0

Payments.	£	s.	d.
Printing Transactions, etc.	272	2	4
Plates, etc.	141	7	0
Rent and Office Expenses	217	17	8
Books and Binding	8	14	7
Investment in Consols	47	5	0
Subscriptions in advance, per contra, carried to 1905	7	7	0
Balance at Bankers'	18	15	5
	£713	9	0

In account with the late Robert McLachlan, Esq, *Treasurer*.

Cash received	£100	0	0	Balance at Bankers' due to his Representatives	£100	0	0

Testimonial to the late Mr. W. R. Hall, *Resident Librarian*.

Subscriptions received	£50	7	1	Amount paid	£50	7	1

Assets.	£	s.	d.
Subscriptions in arrear considered good (say)	50	0	0
Cost of £805 9*s.* Consols	792	3	0
Cost of £239 12*s.* 4*d.* Birmingham 3 per cent.	250	0	0
Balance in hand	18	15	5

No Ascertained Liabilities.

A. Hugh Jones,
Treasurer.

Additional Assets.

Contents of Library and unsold Publications.

Edward Saunders.
J. W. Yerbury.
R. Wylie Lloyd.

13th January, 1905.

THE PRESIDENT'S ADDRESS.

Gentlemen,

It is a great pleasure to be able to congratulate the Society on another year of prosperity. I need add no words on this subject to the Report of the Council.

The thoughts of prosperity and stability are inevitably associated with the memory of one who worked long and hard to secure these advantages for us, of one whose death in the midst of his official work will always invest the past year with peculiar pathos. All that has been gained by the devotion of our late Treasurer will, we know full well, be preserved for us by the care and skill of his successor, who most kindly consented to come forward and help us, almost without notice. I am sure that you will wish to express special gratitude to Mr. Albert H. Jones for his services to the Society under circumstances of great difficulty and sorrow.

The loss of so important an officer as the Senior Secretary is a serious event in the history of any Society, and in the retirement of Mr. Herbert Goss we are losing one who has served as an officer for the record-breaking period of fifteen years. He first entered the Council in January 1885, and was almost at once induced to accept the Secretaryship, holding the position from 1885 to 1897. The Society, however, could not assent to his permanent withdrawal, and in January 1901 he was again elected to the office which he held until his retirement on the present occasion. We shall greatly miss his genial presence from the official chair, as well as the advancement of the interests of the Society which his position enabled him to promote so successfully. Our warmest wishes go with him: we know that the feelings which prompted him to do so much for our community in office will still remain the same out of office, and that the Society has no more loyal member or truer

friend. We are fortunate in securing as his successor one who has already acted as Secretary, and knows full well the difficulties and responsibilities as well as the keen interest and the honour that belong to the position. To his many other qualifications Commander Walker adds this supreme qualification. The Society has never had an officer with a wider experience of Entomology, or one who, from his capacious and varied store—material and mental—has more freely extended help and sympathy to his brother Fellows.

Amid these changes we remember with especial gratification that the tried and trusted services of our Librarian, Mr. G. C. Champion, and of Mr. H. Rowland-Brown, who now becomes Senior Secretary, are still to be employed for the benefit of the Society.

Robert McLachlan, F.R.S.—No more pathetic event has happened, in our history of well nigh three-quarters of a century, than the death of a chief officer, in the midst of the work which he loved,—work which, in spite of the weakness and anxiety induced by ill-health, always commanded his devotion and energy.

So full of zeal was our late Treasurer for the welfare of the Society, that there is reason to fear that the inability to perform the important duties of his responsible post was a bitter disappointment added to the inevitable troubles of illness. It is some satisfaction to know that the Council took every possible step to allay that anxiety, and to feel that their action was attended by some measure of success.

In the "Chapter of an Autobiography," which forms the concluding part of McLachlan's second presidential address to this Society* we gain very clear knowledge of the early age at which he showed himself pre-eminently fitted to be a student of Nature. This is probably always true of those who are to achieve high distinction in this great school of learning. We may give opportunity generously, and be the richer for the free growth of genius under the most favourable conditions: we may refuse opportunity and receive as our due deserts a power which makes for good cramped and stunted. But under any circumstances the power itself is from within.

* Proc. Ent. Soc. Lond. 1886, p. lxxxi.

A great naturalist no less than a poet "is born, not made." Science is fortunate in the circumstances which surrounded the youth of Robert McLachlan :—childhood up to the age of fifteen spent on the borders of Hainault Forest, with all the varied interests botanical and zoological which such surroundings would awake in those with eyes to see them,—removal to London with its stores of literature within easy reach and kind friends to aid the young student in the search—the experience, so inspiring to the naturalist, of a long voyage, with two months' hard work plant-collecting in Australia—an introduction on the return home to the great Robert Brown who gave first kind help, then sound advice. Then after this broad foundation in natural history as a whole, the stimulus towards special work received at the psychological moment from the writings of Hagen. To this inspiration, when he was about twenty-three, we can trace the growing interest which culminated in the great work of McLachlan's life, the "Monographic Revision and Synopsis of the *Trichoptera* of the European Fauna" (1874–1880), appearing between the ages of thirty-seven and forty-three. To his early training is due that rare breadth of knowledge and interest which made him so ready and learned a contributor to the discussions at our meetings—so valuable a helper to those who came to him for advice.

Robert McLachlan was a Fellow of the Society for nearly half a century, having been elected in 1858. He acted as Secretary from 1868 to 1872, as Treasurer from 1873 to 1875 and again from 1891 to the time of his death. He was President in 1885 and 1886. I have already spoken of his remarkable devotion to the Society. A certain apparent cynicism formed a veil which to a large extent concealed the real man from the sight of all but intimate friends. But there existed beneath a zeal and a strenuousness in disinterested service which is utterly inconsistent with cynicism. At times when the Society has been divided by conflicting opinion it has been my privilege to know that his own feelings were far less concerned with the subject of dispute or with the success of either party, than they were with the Society itself, in grave anxiety lest it should be injured by the struggle. In thus speaking, as is

only due, of his patriotic devotion to the Entomological Society of London, it is right to place beside it the "Entomologist's Monthly Magazine" which he served with equal zeal. He acted as an Editor from the very commencement in 1864, and upon the death of H. T. Stainton in 1902 became proprietor.

It is not necessary on this occasion to do more than allude to the long list of valuable memoirs, chiefly dealing with the Neuroptera, but by no means confined to this Order, which came from his pen. They were communicated to the scientific literature of many lands, and their author received from numerous scientific Societies on the Continent the highest honour which is in their hand to bestow. His election to the Fellowship of the Royal Society in 1877 took place in the midst of the years during which his Monographic Revision of the Trichoptera was being given to the world, and is an interesting indication of the instant recognition won by that great work.

I have not thought it necessary or even advisable on this occasion to repeat the whole of the interesting details of McLachlan's life and work which are to be found elsewhere.* Here, and in the special circumstances of his death while still holding the reins of office, I have preferred to speak chiefly of his relations to this Society, and of the circumstances which contributed to make him so valuable a member of our community. I trust I have been able to bring before you some of the reasons for the high honour that will ever be due to the memory of the warm friend the Society has lost.

Charles Golding Barrett joined the Society in 1884. By his death on December 11 we lose one of our most valued Fellows and an indefatigable worker. He was born at Colyton, Devonshire, on May 5, 1836, and entered the Civil Service in June 1856. He passed through the usual stages of promotion up to 1875, when he was appointed a Supervisor of Excise. In 1884 he was promoted to an Inspectorship, and was made a Collector of Inland Revenue at Lynn in July 1886. He was further promoted to a first-class Inspectorship

* "Entomologist's Monthly Magazine," July 1904, pp. 145–148. The Royal Society. Obituary. "Entomological News," September 1904, pp. 226, 227.

in October 1889, and subsequently, in August 1895, he became Collector of London South, where he remained until pensioned in April 1899. Throughout this long and varied official life his genial nature and kindliness of spirit endeared him to all his colleagues.*

The successive stages of such a career implied residence in different parts of the kingdom, bringing opportunities of studying the fauna and flora of varied districts, opportunities most welcome to this ardent naturalist.

In writing the following brief statement of Barrett's distinguished entomological career, I desire to acknowledge the assistance received from Commander Walker's sympathetic account in the "Entomologist's Monthly Magazine." The absorbing interest of Barrett's life became manifest in his boyhood. The first published observations which can be traced to his pen appeared in 1856, when he was twenty ("Entomologist's Weekly Intelligencer," vol. i, p. 165), and from this time until the end of his life he was a constant contributor to Entomological literature. His name appears in the Index of the "Entomologist's Monthly Magazine," as the author of no less than 330 separate communications. When we remember that this periodical only came into existence in 1864, we gain some idea of his energy and industry.

Our knowledge of the Lepidoptera in varied and widely separated parts of the British Islands has been greatly extended, as the late naturalist moved from one district to another:—to Dublin in 1859, to Haslemere in 1862, to Norwich in 1868, to Pembroke in 1875, to King's Lynn in 1886.

Barrett's great work on "The Lepidoptera of the British Islands" was begun in 1892, and all British naturalists will deeply regret that the guiding hand is no longer here to complete it. We shall miss his experience and control exactly where it will be wanted most—in the Micro-Lepidoptera. In fact many have regretted, as they saw the length to which re-description and re-illustration of things pretty well known

* I owe the information concerning Mr. C. G. Barrett's official career to the courtesy of the Editor of "The Civilian."

were carried in the earlier volumes, that the author had not reversed the method of his building, and begun with the Micro-Lepidoptera.

C. G. Barrett became a Fellow of our Society in 1884. He served on the Council in 1892–3, and again in 1900–01, and was a Vice-President in 1901. He was President of the South London Entomological Society in 1892, and was an important member of the editorial staff of the "Entomologist's Monthly Magazine" from 1880 until his death.

We deplore the loss of one who was ever ready to help his brother naturalists, one who invariably acted up to the high standard of those words which accurately express the living principle of our Society:—that we "are all members one of another."

We have also to mourn the loss of two Fellows who have joined our community within recent years:—E. G. J. Sparke, B.A., elected in 1897, and W. F. Urwick, elected in 1900. Both were well-known collectors of insects, comrades of Fellows, still happily with us, on those delightful occasions when friendships are made and deepened by companionship in the pursuit of a common interest.

Just as the year came to a close, on December 29, the Entomological world suffered irreparable loss in the death, in his seventy-third year, of one of the most distinguished of the twelve great names which stand at the head of our "List of Fellows," Professor Friedrich Moritz Brauer, of Vienna.

Brauer's first entomological publication, a revision of the genus *Chrysopa*, appeared in 1850, and in the course of the next few years he published numerous papers on the biology of the Neuroptera, rapidly rising into the front rank of the European students of that order.

In 1858 Brauer was attracted by the curious life-history of the Dipterous family, *Oestridæ*, upon which he carried out the most minute and painstaking investigations, culminating in the publication, in 1863, of his classical "Monographie der Oestriden." Even with his great ability the production of such a work would have been impossible had he not been almost entirely free from other pre-occupations. This fortunate result was rendered possible by his position as an Assistant

in the University Entomological Museum. In 1873 he was appointed Custodian of these Entomological Collections, and in 1874, Professor of Zoology in the University. At the time of his death he was a Director of the Naturhistorisches Hofmuseum.

Brauer's researches into the biology of the *Oestridæ* led him to found the two great divisions of Diptera—"Cyclorrhapha" and "Orthorrhapha," based upon the form of the pupa. Further researches into the metamorphoses not only of *Oestridæ*, but throughout the Order, led to the publication, in 1883, of a new "System of Diptera," which, with certain modifications, is still considered to be the best as yet brought forward.

Latterly Brauer turned his attention to the parasitic *Muscidæ* (*Tachinidæ*, etc.), and, in collaboration with Julius von Bergenstamm, published a work which marks a considerable advance in the classification of these groups.

The fundamental importance of Brauer's discoveries in two such sharply contrasted sections as the archaic Neuroptera and the comparatively modern, highly-specialized Diptera, fitted him in a very special way to study the broad and difficult question of the classification of the Insecta. His conclusions (Systematisch Zool. Studien, SB. Akad. Wien. xci. Abth. i. 1885, p. 374), "based upon recent advances in anatomy and embryology," were adopted in Dr. W. Hatchett Jackson's learned edition of Rolleston's "Forms of Animal Life" (Oxford, 1888). The most prominent feature of Brauer's classification is the splitting up of the Neuroptera into no less than 7 Orders out of the entire number of 17 adopted by him. An interesting discussion and criticism of the system appeared in Dr. David Sharp's contribution to the Cambridge Natural History (Insects, Pt. i., London, 1895, p. 175).

I have to thank Mr. J. E. Collin for much kind help in drawing up this brief account of the distinguished scientific man whose loss will be so deeply felt by biological Science throughout the world.

The Fellows of this Society will feel, in common with the members of other associations occupying this building, deep regret at the sad death of the late Resident Librarian, Mr.

William R. Hall. Long years of loyal and efficient service have left an enduring memory.

Before I proceed to the subject of my address there is one important point upon which I feel bound to warn not only this Society, but other Scientific Societies as well. I refer to the enduring qualities of the paper on which scientific publications are often printed, and still more emphatically the "paper" on which they are often illustrated. I allude especially to the so-called "art papers," assuredly named on the principle "ut lucus a non lucendo." The opaque, white, polished surface, which yields the most successful "half-tone" and "three-colour" printings, is at present only possible by means of a veneer of china-clay. Dust it is, and we are assured by experts that not many years will pass by before it succumbs to the fate which the highest authority tells us is in store for dust. For the purposes of advertisement, this is no disadvantage: the cynic may even maintain that the writings of the present day are, to the great benefit of the human race, recorded upon a fitting medium. But cynicism has no part in science, and every Fellow of this Society will agree that an age producing scientific records which cannot be made to endure, is an age to be rightly scorned by the generations of the future,—scorned as one that sunk to the lowest level of production, that, intellectually, owing its very existence to the noble standard reached by days yet earlier, took the benefits, and deliberately or carelessly neglected in like manner to assist its successors.

We have only to reflect upon the paramount importance of tradition in order to realize the weight of our responsibilities. Lloyd Morgan, discussing the trend of human development, speaks of a "transference of evolution from the individual to the environment," which "may leave the *faculty* of the race at a standstill, while the *achievements* of the race are progressing by leaps and bounds." * Or, again, he contrasts the progressive evolution of the intellectual and moral edifice of society with the cessation of evolution, perhaps even the declining level of "the human builders that contribute in each generation a few more stones to take a permanent place in the fabric." †

* "Habit and Instinct," London, 1896, p. 340. † *l. c.*, p. 345.

This great edifice was founded on oral tradition. Later on written tradition, and still later printed tradition took its place. When society comes to depend upon the one it in large part ceases to depend upon the others, and in changing its methods it is itself changed. Contrast, for instance, the period in the life of each one of us when we ceased to remember the affairs of daily life and gave our memory into the keeping of ink and paper. Although much was gained in the inevitable change, something was lost. Until recently there have been many people in this country, there are probably a few now, who, unable to read or write, can remember the details of complicated accounts in a manner astonishing and impossible to those who possess these accomplishments. We see that when society in any age has come to depend upon printing it will be through printing and not in other ways that it will contribute its chief share to the social edifice; and this is not a mere truism, for that age will have lost in large measure other powers which would have been developed in earlier times, powers which would still develop if printing did not exist.

Our American friends who enter so thoroughly into the essentials of a subject whenever they direct their attention to it, have not, so far as I am aware, made any determined attack upon this problem. Indeed, the majority of the scientific works, which they so freely and generously place at the disposal of students in other lands, are printed upon material,—I will not call it paper,—constructed of the felted fragments of wood, or of a thin paper backing overlaid and loaded with china-clay. The latter class are abnormally heavy, the former abnormally light.

This is a matter so important that it ought not to be left to the President of your Society to sound the warning. It is a matter which it would have been well if the Royal Society or the British Association had taken up years ago. It is not creditable to have left to our artist brethren a subject of such paramount importance to ourselves; for to them belongs the honour of having made the only serious attempts to improve our practice and to call attention to the evil.

To the trades concerned I would say that it is strange want

of enterprise to continue methods and use materials which only require to be thoroughly understood to insure a swift and sudden collapse for all but the most ephemeral purposes. I know no producer, scientific or other, whose self-respect would suffer the employment of materials, however good the effect, however low the cost, which would not last over so brief a period as five-and-twenty years.

I desire to thank Mr. Horace Hart, Controller of the Oxford University Press, and Mr. J. W. North, A.R.A., for the kind manner in which they have freely given information on this most important matter.

I now pass to the subject of my Address :—

"The bearing of the Study of Insects upon the question, 'Are Acquired Characters Hereditary?'"

To those who incline to criticize the subject of this Address as a raking of the embers of a dead and almost forgotten fire, I would reply that the controversy which sprang into sudden flame—in this country in the year 1887—is still a great memory. I trust that it will ever remain as a great memory. Of August Weismann it has been well said that "he awoke us from our dogmatic sleep." He made us realize that cherished convictions upon fundamental questions were based on nothing more solid than assumptions, and thus administered the most stimulating shock that has been received by the biological world since the appearance of the "Origin of Species."

It was impossible that a controversy of this magnitude could be conducted without frequent appeals to the Insecta. Their structures, functions, and instincts offered evidence so striking in character, and upon a scale so vast, that discussion was inevitably attracted again and again towards this centre. Indeed, the controversy would have been but one-sided, the conclusion unconvincing, had it been otherwise. At the same time discussion is and must be free and, being free, is almost necessarily scattered. To attempt therefore to disentangle from the mass and to present as a whole the evidence offered by the study of insects is of value in two ways. First, we are made to realize the importance of our study : by the contem-

plation of its relation to one majestic example we are prepared for the belief that our subject is essential for the solution of all the widest and deepest problems concerned with organic nature as a whole. Secondly, the attempt for the first time to marshal the whole of the evidence supplied by the study of insects will make it possible to strengthen and amplify certain parts, and thus render the whole fabric better balanced and more stable.

I should wish at the outset to express my indebtedness to the columns of "Nature," by means of which nearly the whole of the controversy has been followed. We are happy in the possession of a single journal in which discussions on general scientific questions are, by common consent, carried on.

"*Acquired Characters*" *defined.*—Before beginning a discussion it is important to remove any possibility of doubt or uncertainty as to the precise meaning of the terms which are employed. The word "acquired" as used in this controversy has been the source of as much confusion as the word "mimicry." Just as almost every one who hears of "mimicry" for the first time assumes that the word means a power of intentional imitation, so the inexperienced think that an acquired character is any new structure which a species has gained in the course of its history. "Why should we not consider every character acquired as an 'acquired character'?" they not unnaturally ask. And the answer is the same in both cases. Because these ordinary and untechnical words were given a special and technical meaning by the writers of memoirs which have become classical. In spite of all inconvenience both words are, in their scientific use, historic, and we must reckon with the fact that they have a special meaning which differs from their ordinary meaning.

Erasmus Darwin was, I believe, the first to use "acquired" in this restricted sense. "Fifthly," he says, "all animals undergo transformations which are in part produced by their own exertions, in response to pleasures and pains, and many of these acquired forms or propensities are transmitted to posterity."* Although Lamarck made a preliminary state-

* "Zoonomia," 1794. Quoted by Professor H. F. Osborn, "From the Greeks to Darwin." New York, 1894, p. 145.

ment of his views on evolution in 1802, the celebrated "Philosophie Zoologique" was not published until 1809, fifteen years after the appearance of the "Zoonomia," and it is uncertain whether the author of the later work had ever seen the earlier treatise. Professor Osborn concludes upon the whole that he had not (*l. c.*, pp. 152—155). However this may be, the technical use of the words "acquired characters" is chiefly due to his memoir. The essential passages are the two following Laws of Lamarck:—

"*Première Loi.*—Dans tout animal qui n'a point depassé le terme de ces developpements, l'emploi plus fréquent et soutenu d'un organe quelconque, fortifie peu à peu cet organe, le developpe, l'aggrandit, et lui donne une puissance proportionnée à la durée de cet emploi; tandis que le défaut constant d'usage de tel organe, l'affaiblit insensiblement, le détériore, diminue progressivement ces facultés, et finit par le faire disparaître."

"*Deuxième Loi.*—Tout ce que la nature a fait *acquérir* ou perdre aux individus par l'influence des circonstances où leur race se trouve depuis longtemps exposée, et par conséquent par l'influence de l'emploi prédominant de tel organe, ou par celle d'un défaut constant d'usage de telle partie, elle le conserve par la génération aux nouveaux individus qui en proviennent, pourvu que les *changements acquis* soient communs aux deux sexes ou à ceux qui ont produit ces nouveaux individus." *

Opposite to the characters which Lamarck spoke of as "*acquired*" are the characters which may be called *constitutional*, *congenital*, *genetic*, *inborn*, *innate* or *inherent*. Other names have been specially proposed in order to render apparent the distinction between these two classes of characters. Weismann employed terms which set forth their different origin. The *inherent* he called *blastogenic*, expressing an origin that lay far back in germ-cell from which the individual arose. *Acquired* characters he called *somatogenic*, to express a later origin due to circumstances which had affected the body-cells.

* "Philosophie Zoologique," tome i. p. 235, Édition Savy, 1873: quoted by Professor E. R. Lankester in "Nature," vol. xli, 1890, p. 415. There had been a tendency in the discussion on this subject to protest against the restricted application of the word "acquired," and it was assumed that the use was quite recent, and in fact due to Professor Weismann himself. Professor Lankester shows the error of this assumption.

The word *centrifugal* suggests characters developing from within rather than as impressed from without: *centripetal* conversely suggests characters impressed upon the individual from without, characters which are not the outcome of internal causes.* Acquired structural changes have also been spoken of as *modifications*, the term *variation* being restricted to characters of germinal origin.†

All the terms suggested for these two classes of characters convey something of a definition. Thus the brief convenient definition of acquired characters as "those modifications of bodily structure or habit which are impressed on the organism in the course of individual life" ‡ is obviously suggested more or less completely by one set of terms, and "those characters or properties with which the individual is originally endowed" § by the other set. Another attempted definition of an acquired character is as follows:—"Whenever an organism reacts under an external force, that part of the reaction which is directly due to the force is an acquired character." ‖ And although it may be impossible entirely to unravel the one part from the other, certain elements may easily be discriminated. For instance, the *starting* of the reaction as contrasted with the sequence of events which make up the reaction itself is obviously an acquired element, and those who maintain the hereditary transmission of acquired characters are required to prove that a reaction which can only be started by an external force in the parent, starts without this stimulus in the offspring.

We owe another definition to Mr. Francis Galton:—"Characters are said to be acquired, when they are regularly found in those individuals only, who have been subjected to certain special and abnormal conditions." * *

Professor Lloyd Morgan's definition conveys nearly the same idea:—"When the complex of stimuli, which constitute the normal environment, are sufficiently altered (to upset that

* "Theories of Heredity," in the "Midland Naturalist," Nov. 1889.

† Prof. J. Mark Baldwin, "A New Factor in Evolution," in the "American Naturalist" for July 1896.

‡ Professor C. Lloyd Morgan in Baldwin's "Dictionary of Philosophy and Psychology," New York, 1901, vol. i, p. 10.

§ E. S. Goodrich, *l. c.*, p. 10.

‖ "Nature," vol. li, 1894, p. 55.

* * *Ibid.*, p. 56.

balance established between environment and innate qualities resulting in the production of a normal individual) to produce an appreciable change, such a modification or 'difference' may be called an acquired character." *

Such results of abnormal conditions undoubtedly supply extremely striking examples of acquired characters, but it is, I submit, a mistake to make too much of abnormality, or to import it into a definition. Some of the most marked and certainly the most easily studied and tested of acquired characters are the differences between the effects of alternative environments, all of which are normal, upon the individuals of a single species. The green colour of a larva of *Amphidasys betularia*, if fed upon broom, is an acquired character, as is the dark colour it would assume upon oak, etc. I think therefore that a more satisfactory definition of at any rate a large class of acquired characters may be framed as follows:—"Whenever change in the environment regularly produces appreciable change in an organism, such difference may be called an acquired character."

Sir Edward Fry has objected to Mr. Galton's definition,—and his objection would equally apply to that which I have suggested above—that "the possibility of inheritance is excluded by the definition, and the inquiry whether acquired characters are inherited is impossible." †

This appears to me to be only a verbal difficulty. Before attempting to prove whether a certain class of characters can be inherited, it is essential to be able to decide whether a given character which it is proposed to test belongs to the class. If a satisfactory criterion can be reached we can proceed with the test even though the name "acquired" be by our definition denied to the character after transmission by inheritance. The interest of the result would remain all the same. If the character were there—appreciable, measurable,—the effects would be incalculable in their importance, and would not be diminished one iota by the consideration that the name would no longer apply. Sir Edward Fry's criticism does indeed

* Baldwin's "Dictionary of Philosophy and Psychology," p. 10.

† "Nature," vol. li, 1894, p. 198. See also Professor Lankester's reply to the criticism, on p. 245.

suggest a change—and I think a desirable change—in the statement of the problem. For the question, "Are acquired characters hereditary?" it would be more accurate to substitute "Can the acquired characters of the parent be handed down as inherent characters in the offspring?"

It is in no way necessary that the acquired elements of a character should be disentangled from the inherent elements, so that we can prove the character as a whole to be dependent upon a controllable external cause, and therefore itself controllable. In fact we speak of a character as "acquired" just as we speak of an article as "manufactured," although the result itself is a complex of the properties of natural substances and of changes introduced by art.*

Lamarck's Second Law a contradiction of his First Law.—Before leaving these general introductory considerations and proceeding to weigh the evidence offered by the insect world, it is of importance to demonstrate that there is an inconsistency in the teaching of Lamarck and his followers which, startling as it is, was never noticed until pointed out by Professor E. R. Lankester in 1894.†

"Normal conditions of environment have for many thousands of generations moulded the individuals of a given species of organism, and determined as each individual developed and grew 'responsive' quantities in its parts (characters); yet, as Lamarck tells us, and as we know, there is in every individual born a potentiality which has *not* been extinguished. Change the normal conditions of the species in the case of a young individual taken to-day from the site where for thousands of generations its ancestors have responded in a perfectly defined way to the normal and defined conditions of environment; reduce the daily or the seasonal amount of solar radiation to which the individual is exposed; or remove the aqueous vapour from the atmosphere; or alter the chemical composition of the pabulum accessible; or force the individual to previously unaccustomed muscular effort or to new pressures

* For an interesting discussion on the relation between "acquired" and "genetic" characters see Adam Sedgwick's Presidential Address to Section D of the British Association at Dover (Report 1899, pp. 759–766).

† "Nature," vol. li, 1894, p. 102.

and strains; and (as Lamarck bids us observe), in spite of all the long-continued response to the earlier normal specific conditions, the innate congenital potentiality shows itself. The individual under the new quantities of environing agencies shows *new* responsive quantities in those parts of its structure concerned, new or *acquired* characters.

"So far, so good. What Lamarck next asks us to accept, as his 'second law,' seems not only to lack the support of experimental proof, but to be inconsistent with what has just preceded it. The new character, which is *ex hypothesi*, as was the old character (length, breadth, weight of a part) which it has replaced—a response to environment, a particular moulding or manipulation by incident forces of the potential congenital quality of the race—is, according to Lamarck, all of a sudden raised to extraordinary powers. The new or freshly-acquired character is declared by Lamarck and his adherents to be capable of transmission by generation; that is to say, it alters the potential character of the species. It is no longer a merely responsive or reactive character, determined quantitatively by quantitative conditions of the environment, but becomes fixed and incorporated in the potential of the race, so as to persist when other quantitative external conditions are substituted for those which originally determined it. In opposition to Lamarck, one must urge, in the first place, that this thing has never been shown experimentally to occur; and in the second place, there is no ground for holding its occurrence to be probable, but, on the contrary, strong reason for holding it to be improbable. Since the old character (length, breadth, weight) had not become fixed and congenital after many thousands of successive generations of individuals had developed it in response to environment, but gave place to a new character when new conditions operated on an individual (Lamarck's first law), why should we suppose that the new character is likely to become fixed after a much shorter time of responsive existence, or to escape the operation of the first law? Clearly there is no reason (so far Lamarck's statement goes) for any such supposition, and the two so-called laws of Lamarck are at variance with one another."

These passages have been quoted at length because they

apply not only to the thought of Lamarck but to those of many modern naturalists as well, and because, so far as I am aware, no attempt has been made to meet the objection. In its most condensed form the argument may be stated thus:—Lamarck's "first law assumes that a past history of indefinite duration is powerless to create a bias by which the present can be controlled; while the second assumes that the brief history of the present can readily raise a bias to control the future.*

I now pass to the discussion of evidence derived from the study of the insect world.

I do not propose to multiply examples, but shall be content with a few of those which seem sufficiently well adapted to illustrate the main lines of evidence. They have been chiefly, but by no means invariably, selected from the Lepidoptera. This is merely due to the accident that my experience has been chiefly gained in this Order, and not because the examples are in any way more suitable or convincing than those of other Orders. As regards the most interesting part of the discussion, that relating to instinct, the most striking examples have of course been chosen from the Hymenoptera.

The origin of the pupal groove which receives the silken loop in Pierinæ, etc.—If we examine the dorsal surface of such a Pierine butterfly as *Pieris brassicæ* or *rapæ* it is at once seen that the first abdominal segment is traversed by a strongly marked line parallel with its posterior boundary. This character is so well marked that it presents all the appearance of a morphological feature.

A study of the living suspended pupa shows that the line is formed by the approximated lips of a groove which receives the silken loop or "girdle" as it is often called. Longitudinal vertical sections of the dorsal cuticle are of course transverse to the line, and reveal the fact that the bottom of the groove is specially thickened. Here was a feature at first sight strongly suggestive of the mechanical effects of linear pressure, pointing to an origin in a kind of mutilation performed by the silken cord upon the soft freshly-exposed surface of the pupa. When I found that removal of the loop

* "Nature," vol. li, 1894, p. 127.

before pupation, but after the period at which the larva could spin another, did not alter the normal appearance of line and groove in the resulting pupa, I was for the moment convinced that acquired characters are hereditary. But fortunately the inquiry did not come to an end at this point. It was observed that the Pierine pupæ which furnished the material for experiment (*P. brassicæ* or *P. rapæ*) invariably suspended themselves either horizontally or vertically with the head upwards,—*never* vertically with the head downwards. Several larvæ of *P. brassicæ* had fixed themselves in the normal vertical position preparatory to pupation, upon a sheet of glass. Before pupation, but after the period at which the larvæ could fix themselves afresh or indeed make any attempt to spin, the glass sheet was rotated through half a circle, so that all the larvæ came to be suspended head downwards. In this position they were compelled to pupate. The condition of the resulting pupæ clearly refuted the hypothesis of a mechanically-created groove and thickening, caused by the cutting into and pressure upon the soft yielding cuticle. For in the vertical position with head downwards the pupa slips through the silken loop beyond the position of the groove, so that the pressure has to be borne by an unprepared part of the cuticular surface. Upon the mechanical hypothesis, we should expect that the fresh surface would gain some measure of resistance from the strain ; but on the contrary the pupæ were all hopelessly deformed and the imagines,—if indeed they could have emerged at all,—would have been incapable of flight.* It is evident that from the very beginning the loop has been accompanied by a sufficient strengthening of the part of the surface exposed to its pressure as soon as the larval skin was thrown off.

The silken loop together with the attachment of the posterior extremity of the pupa is in all probability the persistent trace of a vanished cocoon, and we may imagine the selective process which made good each step on the road of gradual

* This experiment has not been published hitherto. It was however described and the pupæ exhibited in the discussion in Section D of the British Association at Manchester, on Monday, Sept. 5, 1887. See Report, p. 755.

transformation. A cocoon is one form of passive defence, cryptic colouring is another, although the two are commonly combined, especially in cocoons built to endure for comparatively long periods, including the times of special stress,—the winter of the northern belt, the dry season of more southern latitudes. The original decline of the cocoon was probably favoured by a short pupal period falling wholly within the time of least stress,—summer or the wet season. When the cryptic colouring of the bare pupal surface is as effective for concealment as that of the cocoon, it presents certain advantages over the latter. The secretion of a large quantity of material is unnecessary and tell-tale movements in the period before pupation are greatly reduced. These benefits are conferred when the concealment afforded is equal; but the pupal cuticle lends itself to certain forms of cryptic defence much more freely and completely than the walls of the cocoon:—to the production of angular shapes and of smooth or polished surfaces, to the attainment of varied colours and the perfect gradation of tints, above all to the power of individual colour-adjustment. This latter culminating effort of adaptation—so commonly possessed by larvæ and exposed pupæ—is apparently extremely rare in the cocoon. Indeed the only positive evidence of its existence is supplied by *Hylophila* (*Halias*) *prasinana*,* and even in this case it would be satisfactory to repeat the experiments on a far larger scale than has been as yet attempted. The transition is easy from a loose and open cocoon with apertures through which the cryptic colours of the enclosed pupa could play their part in defence, through stages in which the latter element becomes more and more important as the cocoon progressively diminishes, to the climax when the almost invisible remnants of the silken covering are retained as supporting structures merely. In all except small and light pupæ a point would be reached, at a greater or less distance from the climax, when some special strengthening of the cuticle exposed to the strain became the indispensable condition of further advance. Thenceforth further reduction and further strengthening would proceed together, the existing groove and thickening being but the

* Trans. Ent. Soc. Lond., 1892, pp. 448–451.

concentration of the broader band of pupal tissue specially prepared to meet the pressure when it first became a danger.

Comparison with the pupæ of some of our common British Geometræ supports the hypothesis set forth above; for it is seen that very similar changes have independently occurred, and occurred so recently that the essential stages are still preserved. Furthermore, they are invariably met with in species which have a short pupal period passed in the warmer months of the northern year. *Eugonia quercinaria* spins a loose and open cocoon, within which the chrysalis, as well as the larva before pupation, develops an effective cryptic colouring.* Both larva and pupa are freely exposed to view through chinks in the scanty network and between the imperfectly united leaves. *Uropteryx sambucaria* constructs a slight hanging cocoon, affording very little concealment. The enclosed pupa bears a marked cryptic appearance, while the only experiment which has been made indicates the possibility of a well-developed power of individual colour adjustment.† Both these species, and especially the last, have long since reached the stage at which the reduction of the cocoon became advantageous. In the genus *Zonosoma* (*Ephyra*) we independently arrive at the same climax of reduction attained in the *Pierinæ*, etc., the cocoon being represented by a supporting loop and the means of fixation of the posterior extremity.‡ No search has been made, so far as I am aware, for a special strengthening of the cuticle upon which the loop presses, but it is probable that nothing of the kind is required by these small light pupæ. The exposed Ephyrid chrysalis is fully as cryptic as that of the average butterfly, but it lacks the power of colour adjustment. When the Ephyrid larva is dimorphic, green or brown, the colour of the pupa corresponds to that of the larva from which it developed.§

* Trans. Ent. Soc. Lond., 1885, p. 319.

† See "Colours of Animals," London, 1890, pp. 111, 112. Only one example was placed on white paper before pupation. Although the resulting chrysalis was very pale and strikingly different from the ordinary appearance, the evidence is quite insufficient, and it is much to be hoped that the experiment will be repeated upon a large scale.

‡ Trans. Ent. Soc. Lond., 1884, p. 57.

§ Trans. Ent. Soc. Lond., 1884, p. 51; Phil. Trans. Roy. Soc., vol. 178 (1887), B., pp. 437, 438.

Such correspondence has not been observed in any other Lepidopterous insect.

If we take into account the fact that *Zonosoma* (*Ephyra*) is a characteristic Geometrid genus, although its method of pupal suspension is unique in a family whose species make cocoons or bury, we may feel confident that it has been descended from cocoon-making ancestors, and that *Eugonia quercinaria* and *Uropteryx sambucaria* give us a clear idea of the steps by which the reduction was effected.

The effect of Gravity upon the shape of suspended pupæ such as those of the Nymphalinæ.—Every naturalist who has watched the pupation of a Vanessid must have observed the extraordinary mobility of the abdominal region of the freshly-exposed chrysalis. Movements of remarkable amplitude take place in every direction, and especially in the dorso-ventral plane, these latter being essential for the withdrawal of the posterior segments from the larval skin and the remarkable feat of attachment to the silken boss close to the point from which the skin itself is hanging. Success is only rendered possible by the remarkable contractile power of the intersegmental muscles along the median ventral area. These, by their contraction, keep the rigid hook-armed apex of the abdomen firmly pressed to the outside of the larval skin up which it is being forced, and enable it to press down or push aside any of the stiff spines which oppose the movement: these finally bring it to the small silken boss which alone provides a secure basis of attachment for the terminal hooks. For this purpose the ventral muscles require to be far stronger than those of any other region, and we invariably find that they entirely overbalance the dorsal intersegmental muscles in pupæ which have been produced on the floor of the breeding-cage. In such pupæ the abdominal segments are curved round towards the ventral side, so that the long axis of the apical part forms at least a right angle with that of the thoracic region, and this attitude becomes stereotyped with the hardening of the pupal cuticle and the consequent loss of all power of dorso-ventral movement. These free pupæ form a striking contrast with the normal attached individuals in which the long axis of the abdominal segments

is nearly in the same line with that of the thoracic. Suspension by the posterior apical hooks and the assumption of a form in which the long axis of the body is nearly in one line, is very ancient, dating back to the common ancestor of a number of closely-related species. For a countless number of generations the soft and yielding Vanessid pupa has been subjected to the strain of gravity and has responded by the production of a definite shape, viz. one in which the long axis is parallel with the line of force. And yet not a trace of any hereditary effect is manifest. Remove the strain and the individual is free, unbiassed by the forces exerted upon unnumbered ancestors, to assume an entirely different shape.

Vanessid pupæ alone, so far as I am aware, have been studied from this point of view. Figures of other suspended Nymphaline pupæ however indicate that all do not yield equally to the strain, although I believe that all are to some extent affected. The pupæ of the *Argynnidæ* contrast in an interesting manner with those of the *Vanessidæ* in this respect. The strongly-curved pupa of *Argynnis aglaia* figured by W. Buckler * was probably supported wholly or in part by a leaf, as is suggested not only by the shape but the plane of the surface of attachment, as shown in the figure, and to some extent by the description.

Variable Protective Resemblance in Insects.—The power which it is now known that many larvæ and pupæ possess of changing their colour into correspondence with the tints of each one of several possible environments has been thought to favour the Lamarckian interpretation of the origin of variation. Thus the late George J. Romanes said of the evidence which had been brought forward to prove the power in question :—" It has always appeared to me that the experiments themselves are among the most valuable which have hitherto been made regarding the causes of variation," † an opinion due, as the writer states, to his acceptance of the " Lamarckian conception."

On the other hand, I have never doubted that the results are in the nature of a climax rather than a foundation, that

* Ray Society, " Larvæ of British Butterflies and Moths," vol. i, Plate X, fig. 3*b*, 1886. † " Nature," vol. xxxviii, 1888, p. 364.

they represent the highest achievement of natural selection in the protective colours of insects. If these variable colours represented the beginnings of ordinary fixed colour variations the species would lose and not gain by the change. The essence of the protective value is the power of being concealed in each of several different environments, and hereditary transmission of the results would only injure the individuals of the next generation. The intricacy of the processes by which the stimulus gives rise to each appropriate colour-effect is no difficulty to the interpretation based on natural selection—"an agency capable of dealing with complex physiological relationships in precisely the same way that it deals with all other kinds of variations." *

The barren conception of "self-adaptation,"—the hypothesis that organisms possess a constitution which compels them to react adaptively, breaks down when we find the adaptation is only possible by means of a specialized and complex train of physiological sequences.

We must remember that the species we investigate are "heirs of all the ages," thoroughly inured to experimental research, past masters in the art of meeting by adaptive response the infinite variety of stimulus provided by the environment. If we remember this we shall always be on our guard against a too hasty interpretation based on the fundamental properties of protoplasm.†

The hypothesis that organisms are so built that they must produce useful variations, seems to be little more than the old "internal developmental force," or "innate tendency towards perfection," in a modern dress. Furthermore, a consideration of the essential meaning of adaptation proves the futility of any such attempt at explanation. The ultimate object of adaptation is to obtain food, to escape enemies, or to subserve reproduction. The most conspicuous adaptations manifested by an individual are relative to the condition of the organic environment with which its contact is in many respects

* Professor Meldola in "Nature," vol. xxxviii, 1888, p. 389. See also Professor Meldola's Presidential Address in Proc. Ent. Soc. Lond., 1896, pp. lxx, lxxi ; and the first scientific paper published by him, viz. Proc. Zool. Soc. 1873, p. 153.

† "Nature," vol. lxxi, 1905, p. 244.

irregular, uncertain, or even wanting. Caterpillars are provided with beautiful protective adaptations, but the successful individual never comes into contact with an enemy. But there is an environment which the organism cannot avoid, —the physico-chemical stimuli of climate and food ; and it is presumably here, in the inorganic conditions of life, that the influences which bear a pre-eminent part in evoking useful variations are supposed to reside. So that stimuli provided by one form of environment are looked upon as the direct causes of adaptations which are essentially related to another and very different environment.*

The Instincts of Insects.—Those who advocate the hereditary transmission of acquired characters have made great use of the argument that the wonderfully complex and precise adaptive instincts of insects require for their production the accumulation of experience and of effort through many generations. Only by such transmission, they maintain, is it possible to understand such development.

It is safest to begin with a definition, and I accept the brief, convenient and in my opinion entirely accurate statement of Lloyd Morgan:—" Instinct depends on how the nervous system is built through heredity ; while intelligence depends upon how the nervous system is developed through use." †

We observe in the first place that the Lamarckian interpretation places the more difficult phases of the evolution of instinct —the phases when it was not instinct at all but something much higher—in some remote epoch of the past, and at a lower level of progress. In such times, *ex hypothesi*, the less developed and presumably less efficient brains of insects did by the intelligent use of experience what they now do mechanically by instinct. This is an inversion of the probable course of evolution: the less efficient instrument has assigned to it by far the more difficult task.

Apart from this *primâ facie* objection there are solid grounds for the belief that the exquisitely perfect operations of insects with which we are familiar arose as instincts, as

* The substance of the argument set forth in this paragraph was published by the writer in "Nature," vol. l, 1894, p. 445.

† "Animal Behaviour," London, 1900, p. 120.

instincts were gradually perfected, and that intelligence never came into the history at all.

It is not from the insects which have had the most varied experience of enemies, most opportunity of learning by contact with danger how to avoid them, and thus of developing their nervous systems through use, it is not from these that existing forms have been descended, but from precisely those which have had the least experience. Even for ourselves experience is spoken of as "the stern guide." To an insect she is apt to be so stern as to lose all her educational value. The less an insect sees of her the better the chance of existence and of representation in the generations of the future. The prime necessity for an insect, as for all animals which cannot in any real sense contend with their foes, is to avoid experience of them altogether.*

This is an argument with the broadest possible application to all Orders of insects. To the adaptive movements of a beetle which when disturbed falls to the ground, draws in its limbs and antennæ, and looks exactly like a little lump of earth; to the alertness of a fly to take wing before an enemy is within striking distance; to the perfection of all such means of defence in insects, and they are numberless, we may apply the words of Browning:—

> "Oh, the little more, and how much it is!
> And the little less, and what worlds away!"

It is all the difference in fact between success and failure, between life and death. Comparatively rarely are the conditions of the struggle such as to admit of partial failure or of improvement by experience.

One special reason for the passive means of defence adopted by the vast majority of insects is to be found in the peculiar dangers of their structure. Especially is this true of larvæ, with their hæmolymph contained in freely communicating

* This argument was brought forward by the present writer in the discussion on "Are Acquired Characters Hereditary?" at the meeting of Section D of the British Association, at Manchester, Sept. 5, 1887 (Report, p. 755). No part of the discussion is published. The argument is however briefly stated in Proc. Boston Society of Nat. History, vol. xxvi, 1894, p. 391, and also quoted in "The Zoologist," Dec. 1900, pp. 551, 552.

cavities, and subject to the pressure of muscular body-walls. Hence an insignificant injury may often cause death or imperfect development from the quantity of fluid which is lost. "It is, I believe, in consequence of these facts that the various means of protection in larvæ are almost always of a passive kind. . . . Nearly all the means of defence against . . . enemies [other than ichneumons, etc.] are such as tend to prevent the larva from being seen or touched, rarely such as to be of any avail when actually attacked. There may be various changes in the mode of defence, but the object is always the same—to leave the larva untouched, a touch being practically fatal." *

Let us consider for a moment the mental operations involved in the act of profiting by experience. Consider, for instance, Mr. A. H. Hamm's interesting observation—since abundantly confirmed by the testimony of many naturalists—that the vast majority of the individuals of *Hybernia leucophæaria* rest with the body horizontal, thus bringing the lines of the wings into parallelism with the dark shadows in the vertical cracks of the oak-bark.† An individual which adopted a different attitude and rested so as to cause the main lines of its pattern to cut the main lines of its environment might indeed escape by flight; but can any one really believe that a moth, or any of the ancestors of moths, could associate the special disturbance and danger to which it had been exposed with the special attitude it had assumed, and would as a result of that association begin to make changes in its attitude? It is easy to speak of improvement by experience, perhaps easy to think of the progress of an insect's education under the sternest of teachers: easy so long as we confine ourselves to generalities. Attempt to picture the process in a definite case, and apply it, as I have done, to account for the growth of some special protective adaptation, and it is instantly borne in upon us that we are placing on insect psychology a load it is altogether unable to bear.

The Cocoon-making Instinct.—There are however numberless examples in which it is impossible that improvement could

* Trans. Ent. Soc., London, 1885, pp. 321–323.
† Proc. Ent. Soc. Lond. for March 19, 1902, p. xv.

be thus effected, even if insects did possess the requisite brains, that is unless we also accord to them the gift of prophecy. These are the cases in which instinct prepares for the dangers of a struggle at some future time, when the organism which manifested the instinct will have changed its form, and become incapable of making further changes in the means of protection, and indeed as a rule entirely incapable of making any defence.

Consider, for example, another observation made by Mr. Hamm in July 1900, upon the cocoons of *Malacosoma neustria* spun within the leaves of black-currant and apple in his garden at Oxford. These he found to be opened by birds, probably sparrows, which had pecked a hole in the leaf, thus breaking through the cocoon at its thinnest point,* and abstracted the chrysalis.

A still more convincing example is to be found in the origin and maintenance of the instincts involved in the construction of a freely exposed yet admirably concealed cocoon on bark. Think of the natural cracks just filled up, of tunnels closed flush with the surfaces around, of the resemblance to excrescences or ridges which appear perfectly natural upon bark. Considering not only the forms but the colours and texture of the external surface, we recognize at once that such structures are the product of a highly perfected group of instincts. At first sight indeed the case seems to prove too much ; for it may be thought that such cocoons are so completely hidden as to defy the sharpness of any enemy however acute, and

* The cocoons were exhibited to the Society on March 19, 1902. See Proc. Ent. Soc. Lond. 1902, p. xv.

Mr. W. Holland many years ago showed that birds attack in this particular way, but his observation was upon larvæ spun between leaves, and not pupæ ; and the latter are specially suited for enforcing the present argument. Mr. Holland's observation is as follows :—

"On the 6th of this month [June 1890, near Reading] Captain Robertson and I went to get some larvæ of *populeti* from some low trees of *Populus tremula* which were covered with that species. Captain Robertson had picked off about 100 larvæ the night before ; but this morning, when we arrived at the trees, we found some starlings had also discovered the caterpillars, and had gone over the trees systematically from branch to branch, pecking a hole in one side of the spun-together leaves, and drawing out the caterpillar, and so nearly had they cleared them all off, that we had much trouble to find a dozen. We caught the birds in the act, and although they had so nearly finished their feast they were very unwilling to go, and loudly objected to our disturbing them."—"Entomologist's Monthly Magazine," 1890, p. 216.

believers in natural selection may properly be asked to bring evidence of the existence of a struggle in which the high elaboration of the instincts in question is a defence. There is no difficulty in meeting the challenge, for specially directed observation at once reveals the existence of a keen struggle in which the concealment of the cocoon is the criterion of life or death.

My attention was first directed to this particular aspect of the struggle for existence in insects, on April 12, 1893, when I found on the bark of *Populus nigra*, near Yoxford, Suffolk, a cocoon of *Dicranura bifida* which had been opened by some enemy, and the pupa removed. The observation is, I believe, a common one, in fact Commander Walker and Mr. Holland inform me that it is usually difficult to find cocoons of this species which have not been thus attacked. Nevertheless, for the sake of those who have not had the experience, I think it is worth while to re-describe the evidence which certainly justifies us in inferring that "an enemy hath done this."

"The edges of the opening were still brown and fresh, as was the interior of the cocoon; and the larval skin remained fresh and untouched inside. The opening was in the middle of the exposed surface and not at one end, as it is when the moth emerges. Besides, the cocoon had been opened and cracked by a blow from some hard object, such as a bird's beak, and the sharp irregular margins were quite different from those of the natural opening made by the moth, doubtless by means of a corrosive fluid, as in the allied species, *Dicranura vinula*, which Mr. O. H. Latter has recently shown to secrete caustic potash for this purpose. Furthermore, the moth emerges far later in the year, and, had it emerged at an exceptional time, the empty pupal skin would have been left behind in the cocoon. We may therefore safely assume that the opening was the work of an enemy, and, as the cocoon was five feet from the ground, it was probably due to some tree-creeping, bark-exploring species of bird. . . . It is probable that the attention of the enemy is directed to any cocoon-like object by the sense of sight, and that the object is then tapped, and, if found to be hollow, opened and the pupa devoured." *

* "The enemies of Lepidopterous pupæ enclosed in bark-formed cocoons."—"Science," xxiii, 1894, p. 62. The date of the observation is

The cocoons of *bifida* are spun in the autumn, but the attack did not take place for several months. The example is probably typical in this respect. The procryptic preparation of the autumn is the adaptation by which the average numbers of the species are kept up in spite of ceaseless bark-hunting during the months when the trees are leafless and food is scarce. The Lamarckian interpretation fails to account for the cocoon-making instinct for two very sufficient reasons : first, a chrysalis is incapable of learning by experience how to improve anything,—even more obviously incapable of learning concerning a structure which it never makes. Secondly, however intelligent a chrysalis may be, the experience itself is of such a nature that its stores of learning cannot be handed down to posterity.*

If the Lamarckian interpretation of the cocoon-making instinct must inevitably fail, as I think we shall agree it must, what is there to put in its place? Those who believe in the efficiency of Natural Selection in evolution will probably regard the instinct of building these beautifully-adapted structures as the outcome of countless generations during which the attacks of enemies have been, on the whole, more successful against the products of less perfected instincts and less so against those of the more perfected. They will further suppose that the increasing perfection in instinct has acted selectively on enemies, sharpening their faculties, until, by action and reaction, the present high level of constructive skill has been reached, and is maintained.

The Instincts of the Hymenoptera.—No discussion of instinct would be in any way complete without a consideration of the most wonderful examples of all, viz. those manifested by the Hymenoptera. The instincts of the Fossorial Aculeates in providing for their larvæ,—studied with all the sympathy of a born naturalist and described by a master of style,—have

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erroneously given as the year of issue instead of 1893. Some of the later sentences of the same communication are also quoted with slight modification on the present occasion.

* This argument also is briefly stated in the "Proc. Boston Soc. Nat. Hist.," vol. xxvi, 1894, p. 391, and quoted in "The Zoologist," Dec. 1900, pp. 551, 552.

formed the foundation of a gigantic speculative edifice. The controversy has in reality been a three-sided one.

I. First, we have Fabre disbelieving in evolution altogether, and adducing evidence that his favourite insects have not gained their wonderful instincts by progressive change; pointing out that they perform their duties under some stimulus which to them is imperative, whether the object of their pains be achieved or not: arguing, for example, that in those that feed their larvæ from time to time, the stimulus to enter and deposit the insect food is not the young larva itself but the door of the tunnel.

II. Secondly, Lord Avebury and the late George J. Romanes have argued in favour of evolution by a gradual education, finally inherited as instinct. There is reason to believe that Darwin accepted the same view. He certainly never opposed it. Lord Avebury alludes to the letter written to Fabre, in which Darwin "refers to the great skill of the Gauchos in killing cattle, and suggests that each young Gaucho sees how others do it, and with a very little practice learns the art." *

Lord Avebury identifies himself with this view, which, indeed, he had himself set forth in the "Contemporary Review," in 1885. Concerning the instinct of the *Ammophila* to sting the ganglionic centres of its caterpillar prey, he suggests that "during these long ages they may have gradually learnt the spots where their sting would be most effective, and . . . so have gradually acquired their present habits." † He finally concludes that "these remarkable instincts" are "the result of innumerable repetitions of similar actions carried on by a long series of ancestors." ‡

George J. Romanes in reviewing Lord Avebury's book goes much further:—"Here, by the way, we have an excellent instance of the difficulty which we so often encounter in the domain of instinct, when we relinquish the so-called Lamarckian principle of the inheritance of acquired characters. The hypothesis in question goes upon the supposition that

* Sir J. Lubbock, "On the senses, instincts, and intelligence of animals, with special reference to insects." London, 1888. Internat. Sci. Ser., p. 248.

† p. 248. ‡ p. 252.

some of the ancestors of the Sphex were intelligent enough to notice the peculiar effects which followed upon stinging insects or caterpillars in the particular regions occupied by nerve-centres, and that, in consequence of being habitually guided by their intelligence to sting in these particular regions, their action became hereditary, *i. e.* instinctive. But if, in accordance with post-Darwinian theory, we relinquish this possible guidance by intelligence, and suppose that the whole of this wonderful instinct was built up by natural selection waiting for congenital (*i. e.* fortuitous) variations in the direction of a propensity to sting, say, the nine nerve-centres of a caterpillar —then it surely becomes inconceivable that such an instinct should ever have been developed at all." *

Eimer is even more rash in his statements:—"This is one of the most marvellous instincts that exists; since the wasp operates on various larvæ with nervous systems of various forms, she must effect the paralysis in various ways, and even apart from this, she makes a physiological experiment which is far in advance of the knowledge of man. . . . It may be suggested that the wasp only paralyzed the larvæ in order to carry them more easily; but even if this were the case, she must, since she now invariably acts in this way, have drawn a conclusion by deductive reasoning. In this case it is absolutely impossible that the animal has arrived at its habit otherwise than by reflection upon the facts of experience."

Mr. and Mrs. Peckham make the following comment upon this wild passage from Eimer:—"One can hardly be expected to take such statements seriously, since it is certain that the writer has no knowledge of the life-histories of these insects." †

III. Thirdly, there are those who believe that the instincts in question are to be explained by the operation of natural selection upon hereditary nervous mechanisms, who believe that the Lamarckian principle of the hereditary transmission of education has never come into the history at any stage. Fabre's observations are quite consistent with this view; in

* "Nature," vol. xxxix, 1888, p. 77.

† "The Instincts and Habits of the Solitary Wasps," by George W. and Elizabeth G. Peckham, Madison, Wis., 1898, p. 221.

fact it would almost appear that Darwinian evolution as apart from Lamarckian evolution is really unknown to this great naturalist. He seems invariably to strike Lamarck when he aims at Darwin. In this however he is only acting in the same manner as the majority of the early critics of the "Origin." *

In attempting to decide upon the past history of these insects the first necessity is to be sure of the facts. Fortunately the ground has been re-traversed by Mr. and Mrs. Peckham, so that we can compare the observations of great and keen naturalists in two hemispheres. We find that by the study of nine wasps of an American species, *A. urnaria*, of the very genus *Ammophila*, which, as previously described, chiefly furnished the basis of speculation, the American naturalists have shown that the immense superstructure is in large part due to a fertile imagination. So far from the assumed perfection and accuracy with which every detail is supposed to be repeated, the instinct is shown to be excessively variable. The frequently-quoted conclusions that the object of the sting is to reduce the larvæ to helplessness and yet keep it in a fresh condition, that a dead larva would be unsuitable food and an active one a danger to the offspring of the wasp—all these conclusions are entirely disposed of by a few careful specially directed observations. These show that the larva rapidly dies in a large proportion of cases and yet affords excellent food, and that it may remain sufficiently uninjured to wriggle continuously without stimulation, and to move violently when bitten by the larva of the wasp.†

The following activities or performances are regarded as truly instinctive, viz. as due to the compulsion of a hereditary nervous mechanism :—Stinging, the methods of attack, capture and carriage of prey peculiar to each species, the kind of prey selected, the general style and situation of the nest, the form of cocoon.‡

The American naturalists finally conclude their volume with these words :—"The general impression that remains with us

* "Proc. Boston Soc. Nat. Hist.," vol. xxvi, 1894, pp. 377—379. See also Poulton, "Charles Darwin and the Theory of Natural Selection," London, 1896, chapters xix, xx, pp. 144–160.

† *l. c.*, pp. 30, 31. ‡ *l. c.*, p. 234.

as a result of our study of these activities is that their complexity and perfection have been greatly over-estimated. We have found them in all stages of development and are convinced that they have passed through many degrees, from the simple to the complex, by the action of natural selection. Indeed, we find in them beautiful examples of the survival of the fittest."*

As long ago as 1889 the present writer had argued that the Lamarckian interpretation of the instincts of *Ammophila* or *Sphex* introduced the same difficulty as that alluded to in the discussion of the cocoon-making instinct. It implied a gift of prophecy, a knowledge of what would happen to offspring after the burrow had been sealed and left to its fate.†

Another powerful argument is derived from the comparison between the instincts which are performed but once and those which are performed many times in a single life. Various elaborate performances are undertaken but once in an insect's

* See the review of Dr. and Mrs. Peckham's work in "Nature," vol. lix, 1898, pp. 466–468.

† The argument was used in the "Discussion on Acquired Characters" in Section D of the British Association at Newcastle, Friday, September 13, 1889. See Report, p. 620, where, however, only the title of the paper is printed. The following sentences are quoted from the abstract in "Nature," vol. xl, 1889, p. 610 :—

"With regard to instinct, Dr. Romanes had suggested a difficulty—that was, the instinct of certain wasps to sting and paralyze the nerve centres of their prey. But it must be remembered that the benefits arising from this instinct were felt not by the wasps themselves, but by their progeny."

In "Proc. Boston Soc. Nat. Hist.," vol. xxvi, 1894, p. 392, the argument is stated in greater detail as follows :—

"The wasp-like insect has no opportunity of learning by experience because it can never know whether the larva stored up is a failure or a success. If the larva had not been stung, or, accepting the received accounts, had been stung in the wrong place, it would struggle and perhaps kill the young grub ; or dying of starvation it might dry up and be useless as food. But the Hymenopteron never goes back to inquire. It makes all the difference to the young grubs whether the food provided for them is in an appropriate condition or not, but it makes no difference whatever to the parent insect. The latter seals up the chamber in which its eggs have been laid and never opens it again ; it has no chance of noting the failure or the success of the food it has provided. It is clearly a case like that of the cocoon, which cannot be explained on the Lamarckian theory and must be explained on the Darwinian. And this latter interpretation is easy ; those insects which possessed the nervous mechanism impelling them to provide food in an appropriate condition gave to their offspring the opportunity of surviving and inheriting the same instinct ; while others, impelled to perform less efficient actions, were thereby cut off from any representation in the next generation." The passage has been slightly modified.

lifetime, and thus are always "prior to individual experience."* The behaviour which leads to the production of an elaborate cocoon or the burial of a larva in its earthen cell is clearly instinctive, and the most convincing evidence would be required—evidence which it is needless to say is entirely lacking—in order to prove that certain insects which perform an act no more elaborate many times in their lives are guided by anything except the compulsion of a "nervous system built through heredity."† If the cocoon-making instinct has evolved through selection, the comb-making instinct of the social Hymenoptera has surely arisen in the same way and not through the operation of an entirely different set of causes.

As a matter of fact I have witnessed the perfection of comb-building "prior to individual experience" and under conditions which prevented the worker from profiting by the experience of others. I have seen "the worker of a species of *Vespa* freshly emerged from the pupa, and the sole perfect insect upon the young comb (the queen-mother having been previously killed), immediately seize upon the broken material of the comb and begin accurately and with exact precision to build up the thin and delicate sides of injured cells containing the living larvæ." ‡

The strongest of all arguments against Lamarckian evolution was advanced nearly fifty years ago by Darwin in the first edition of the "Origin of Species"; and here too we see that demonstrative evidence was supplied to the greatest of all naturalists by reflection upon the insect world, and of the part of it which we are now considering. "No amount of exercise, or habit, or volition," he says, speaking of ants, "in the utterly sterile members of a community could possibly have affected the structure or instincts of the fertile members, which alone leave descendants. I am surprised that no one has advanced this demonstrative case of neuter insects against the well-known doctrine of Lamarck." §

* For instance, the cocoon-making instinct, already alluded to (see pp. cxx–cxxiii). Weismann has directed particular attention to this argument against a Lamarckian interpretation ("The Evolution Theory," London, 1904, pp. 155 *et seqq.*).

† "Nature," vol. lxv, 1901, p. 51. The passage has been slightly modified.

‡ *l. c.*, p. 50.

§ "The Origin of Species," London, 1859, p. 242.

It is indeed surprising that Darwin himself, after his own crushing argument against the hypothesis of evolution by inherited experience, should have been willing to admit some tincture of the same principle in other parts of the wide field. If we are perforce thrown upon unaided natural selection for the origin and growth of the most complex and specialized societies of the Hymenoptera, what need have we for co-operating causes of evolution elsewhere?

I conclude this section of my Address dealing with the most remarkable of all nerve-mechanisms of instinct known to us, with the following impressive comparison, made by Professor Lankester, after contemplating the higher forms in which instincts have been replaced by the power of educability. "The character which we describe as 'educability' can be transmitted; it is a congenital character. But the *results* of education can *not* be transmitted. In each generation they have to be acquired afresh. With increased 'educability' they are more readily acquired and a larger variety of them. On the other hand, the nerve-mechanisms of instinct are transmitted, and owe their inferiority as compared with the results of education to the very fact that they are *not* acquired by the individual in relation to his particular needs, but have arisen by selection of congenital variation in a long series of preceding generations."

"To a large extent the two series of brain-mechanisms, the 'instinctive' and the 'individually acquired,' are in opposition to one another. Congenital brain-mechanisms may prevent the education of the brain and the development of new mechanisms specially fitted to the special conditions of life. To the educable animal the less there is of specialized mechanism transmitted by heredity, the better. The loss of instinct is what permits and necessitates the education of the receptive brain."

"We are thus led to the view that it is hardly possible for a theory to be further from the truth than that expressed by George H. Lewes and adopted by George Romanes, namely, that instincts are due to 'lapsed' intelligence. The fact is that there is no community between the mechanisms of instinct and the mechanisms of intelligence, and that the latter are later in the history of the development of the brain than the

former, and can only develop in proportion as the former become feeble and defective." *

The bearing of Insect Warning and Mimetic Colours upon the supposed hereditary transmission of experience by their Vertebrate enemies.—Adaptations which facilitate the education of entomophagous vertebrates are so perfect and so wide-spread in insects that they constitute a large body of indirect evidence in favour of the non-transmission by heredity of the results of experience. Fritz Müller, in his celebrated theory of mimicry, suggested that the object of the likeness between the warning colours of specially-protected species was to reduce the danger from the attacks of young and inexperienced enemies. This is all the more interesting because, as Professor Meldola has pointed out, "in 1879 the question of the non-transmission of acquired characters had not been brought into prominence. It was tacitly assumed in the theory of Bates that a knowledge of edible and inedible types could be transmitted by heredity. It is remarkable that Müller, by virtue of his hypothesis, should have unconsciously challenged this tacit assumption by suggesting that young birds had to learn by experience, and did not derive their knowledge of eatable and distasteful forms by heredity. The whole tendency of Prof. Lloyd Morgan's work of late years has been to confirm the suggestion by actual observation and experiment; and Mr. Finn, also, in summing up this result, states that 'each bird has to separately acquire its experience, and well remembers what it has learned.' Thus the Müllerian theory of 1879 has now been placed on a psychological basis of well-ascertained facts." †

The problem has been attacked from both sides with concordant results. In contemplating the vast scale upon which these aids to memory and education are developed, it is necessary to take into account the pressure of the struggle for existence upon the enemies themselves. "This pressure is chiefly felt by the young, and it is so excessive that comparatively few individuals in the fresh wave sent forth at each breeding season, survive to become mature and experienced. It

* From the Jubilee Volume of the Soc. de Biol. of Paris, 1899. Reprinted in "Nature," vol. lxi, 1900, pp. 624—625.

† "Nature," vol. lx, 1899, p. 57.

follows from this fact that the amount of selective pressure exerted by inexperienced enemies of insects is many times as great as that which is due to the educational period of the mature enemies existing at any moment."* We also realize the fact that insects as food are of far greater importance than might be at first sight supposed; for they supply not only the insectivorous species but those other forms which in turn prey upon them.

Thus, when we bring together the evidence supplied by the study of insects it is seen that it nowhere supports the assumption upon which Lamarckian evolution is founded, the assumption that acquired characters are transmissible by heredity.

Before leaving the Chair at the conclusion of my second year of office I desire warmly to thank the Officers, Members of Council, and Fellows of the Society, who by their kindness have made my task so easy and altogether pleasurable. You will, I know full well, accord the same generous sympathy to my successor, and under his guidance I feel confident that the prosperity of recent years will be continued, I hope in even larger measure.

Before taking leave of the Fellows in my official capacity I desire to direct their attention to two thoughts, both of which I have endeavoured to keep prominently before the Society, thoughts which I trust will continue to inspire our meetings.

First, ever to remember the high significance of the material we study; to realize its priceless value for the elucidation and the solution of problems the most intricate, difficult and important; to feel that this unrivalled opportunity is a serious personal responsibility.

Secondly, always to bear in mind that London is a great deal more than the capital of England, and that the Entomological Society of London can do much to help the work of naturalists all over the world—men in some conditions better off than we are, in other conditions less well provided, with new and inspiring problems at hand calling for study, but

* Proc. Ent. Soc. Lond. 1903, p. lxv. The form of the passage has been slightly modified.

without the stimulus and the continual aid of our vast stores of literature and our easy intercourse with kindred minds. We can do much to help such men, not only by means of our publications but even more by establishing contact with them, by showing them that their work is of value and interest to the naturalists of a distant land. And although I trust and am sure that such encouragement will be offered freely to every naturalist who may approach us, whatever be his nationality, yet the wide extent of the British Empire and the roving spirit of her sons, ensure that it will be our own people in many lands whom we shall chiefly benefit, who will benefit us in turn. And thus we may hope to aid in no small measure the forces that make for sympathy and friendship and true union between men whose communication is thwarted by both time and space. And this happy result will be achieved by and will itself promote the advancement of that branch of learning for which this great Society came into being, grew into strength and beneficence, and awaits I doubt not a yet more glorious future.

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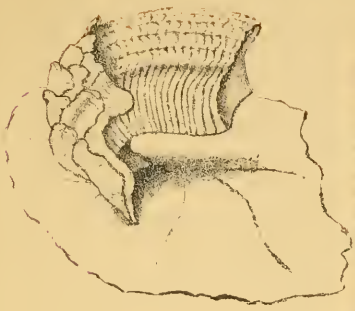
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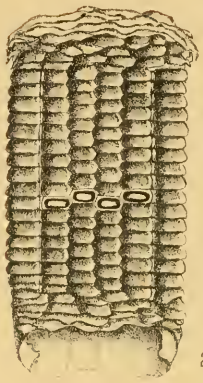
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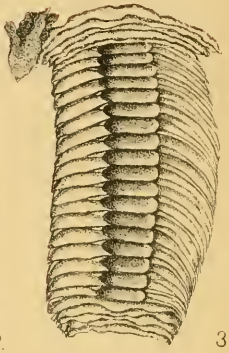
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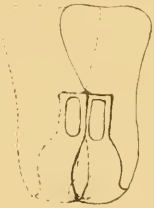
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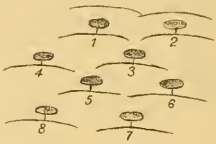

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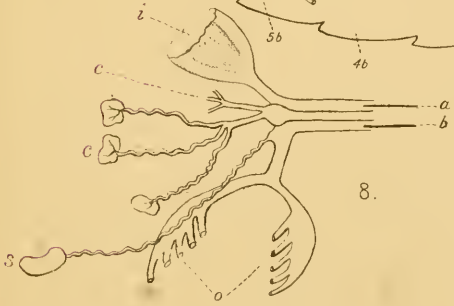

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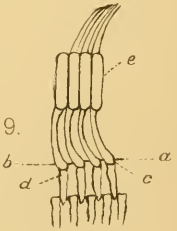

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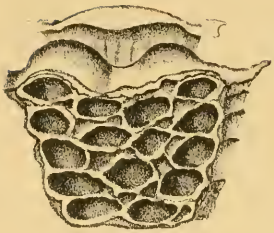
Egg-cases of African Cassidides.

10.



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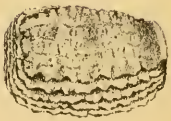

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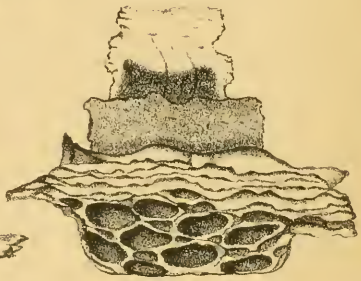

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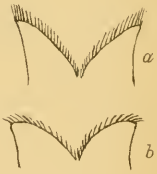

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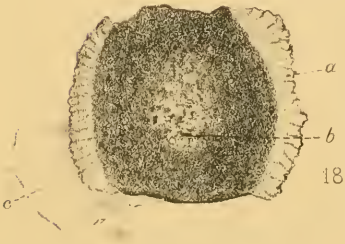

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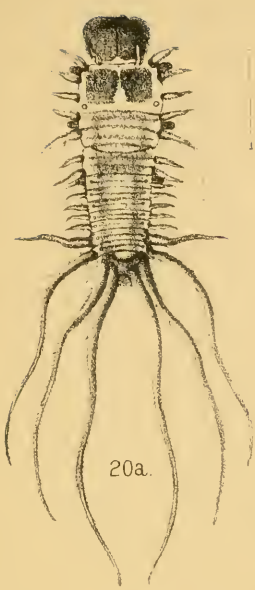
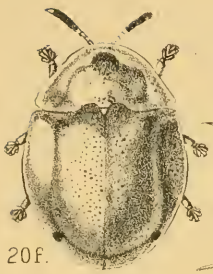
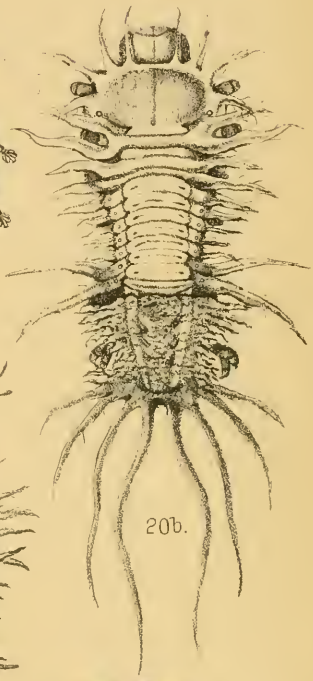
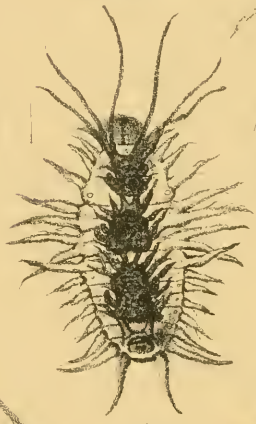
Egg-cases of African Cassidides.









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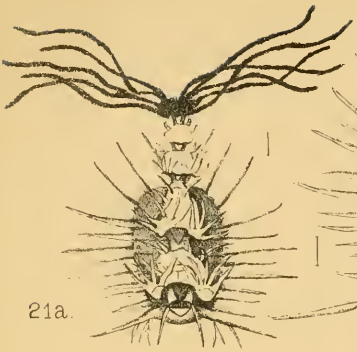
Larvæ etc of African Cassidides.



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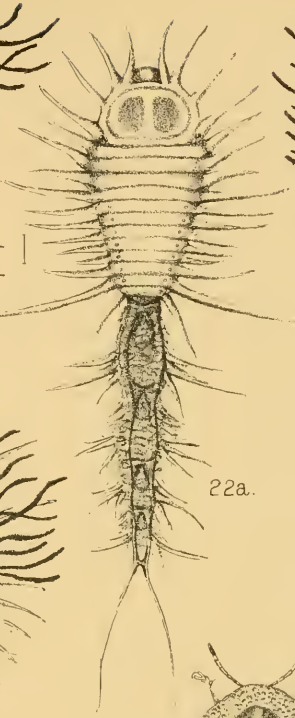

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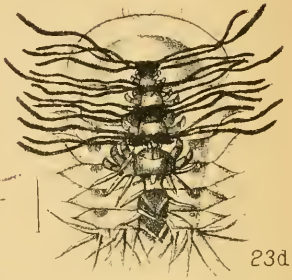

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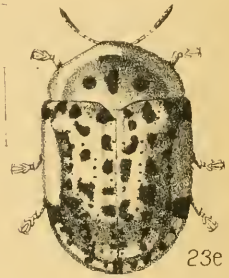

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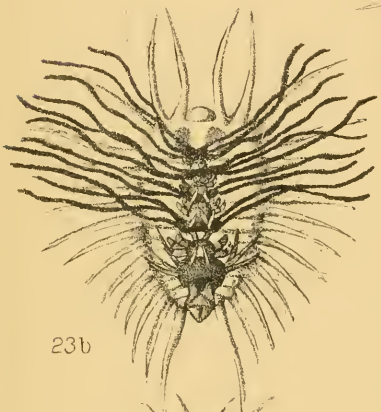

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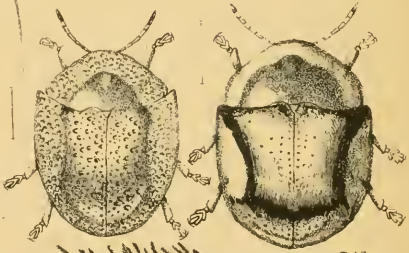
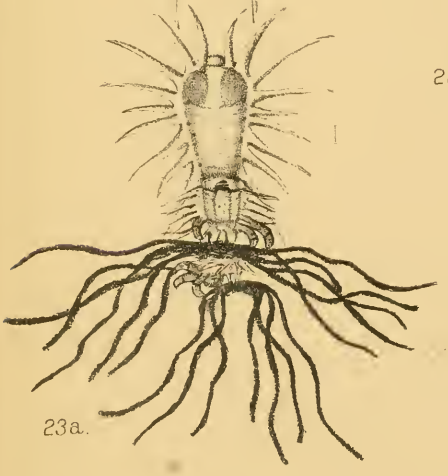


22b.

21b.



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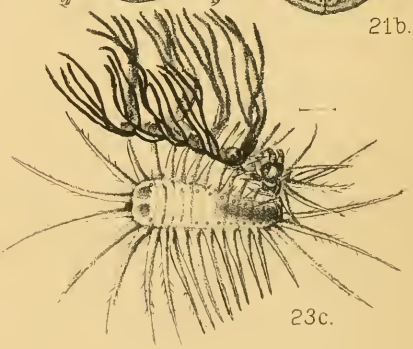

23c.

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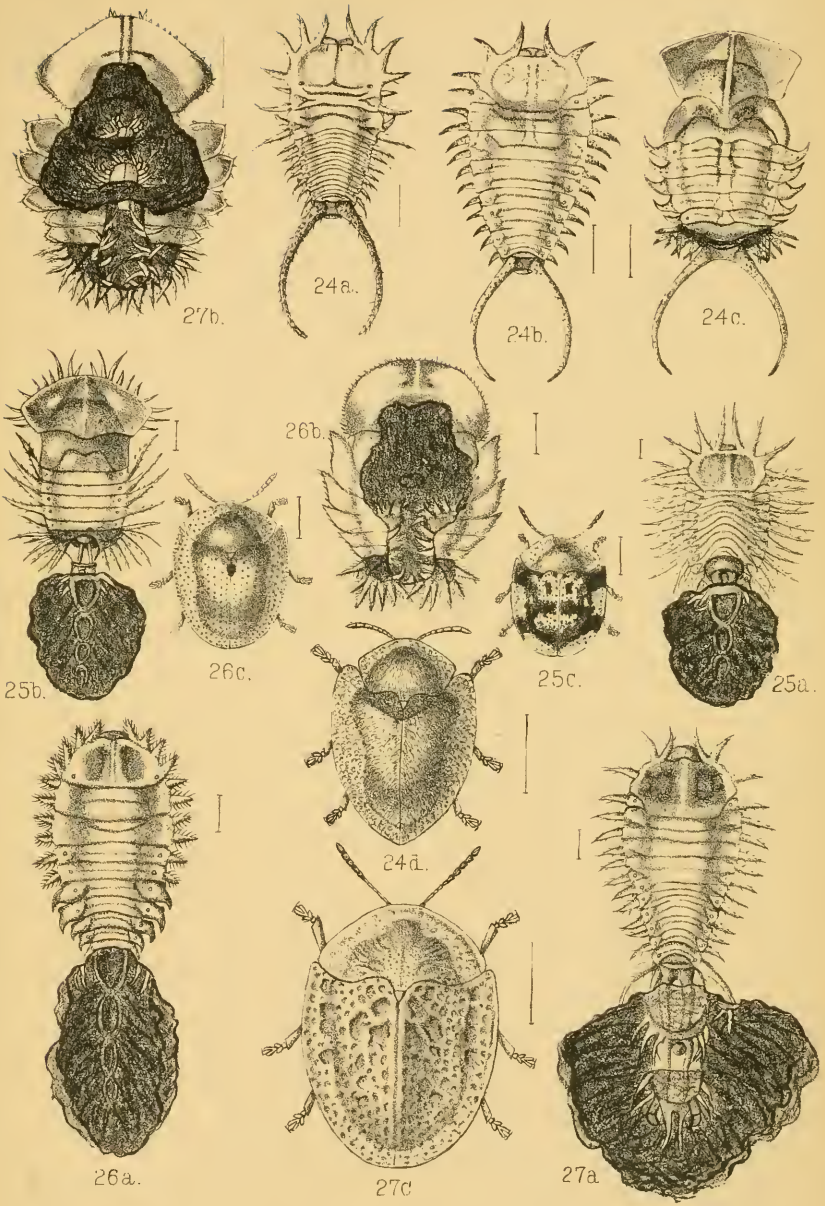
Larvæ etc of African Cassidides.



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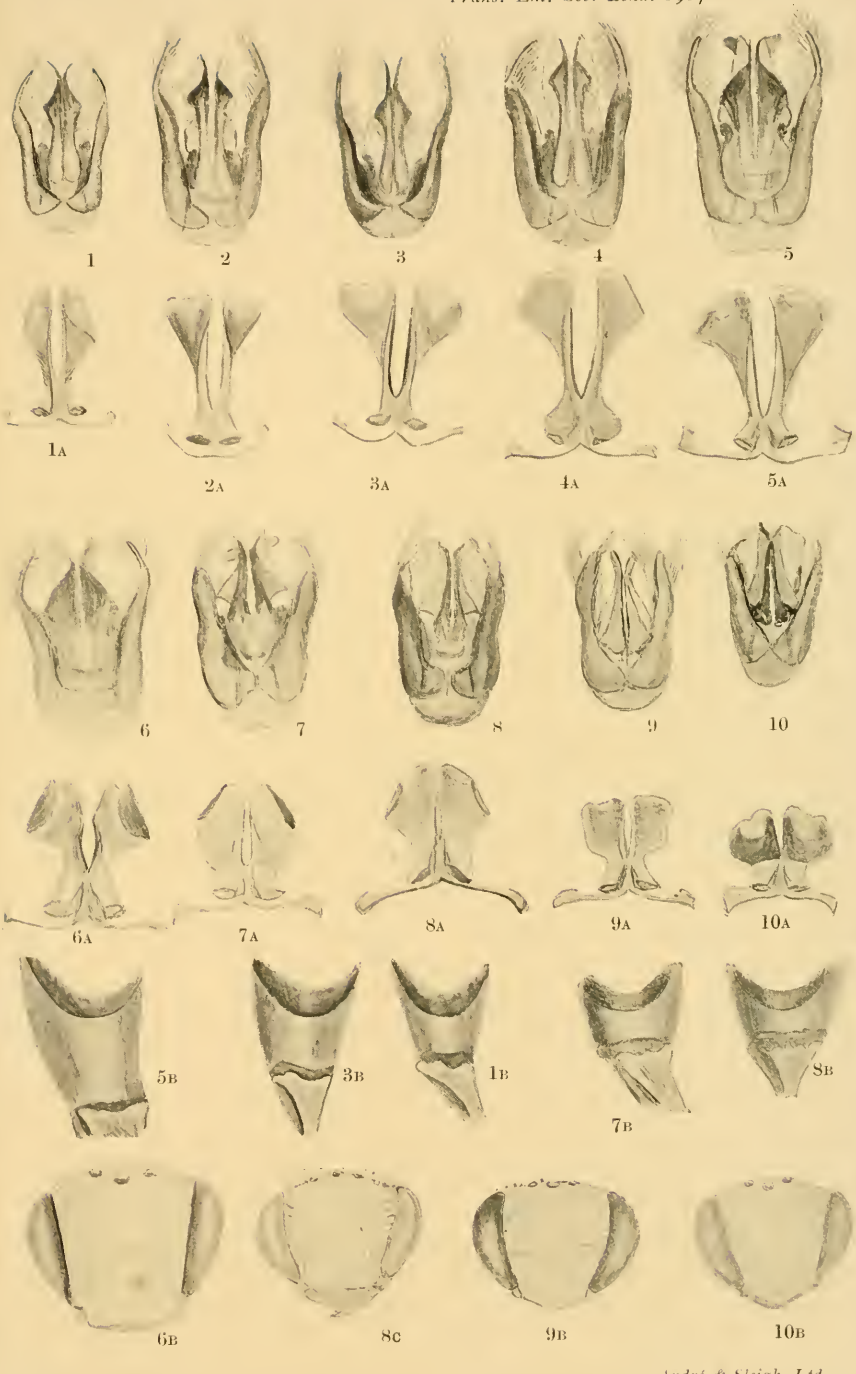
Larvæ etc of African Cassidides.



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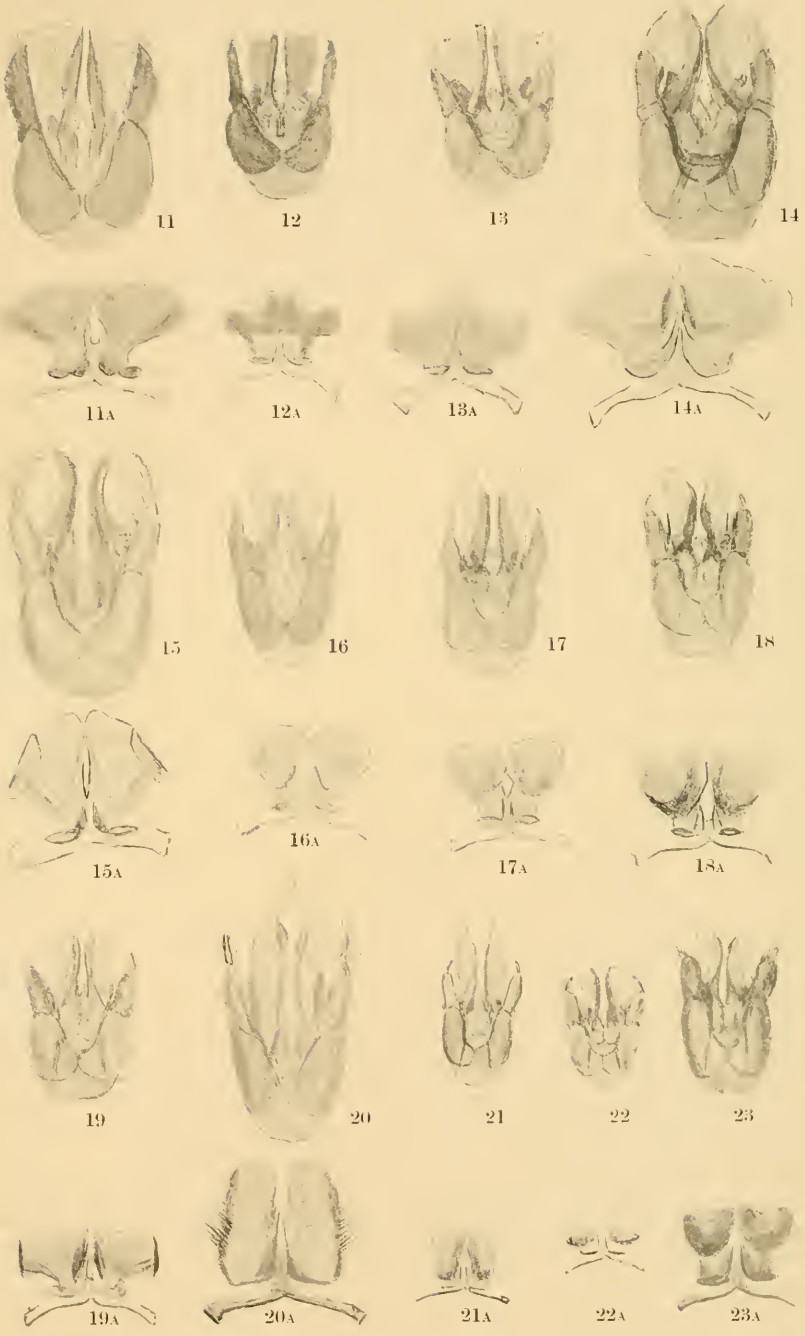
Male Terminal Segments and Armatures in Species of the Hymenopterous Genus Colletes.



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Male Terminal Segments and Armatures in Species of the Hymenopterous Genus Colletes.

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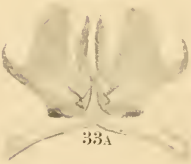

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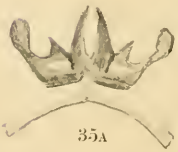

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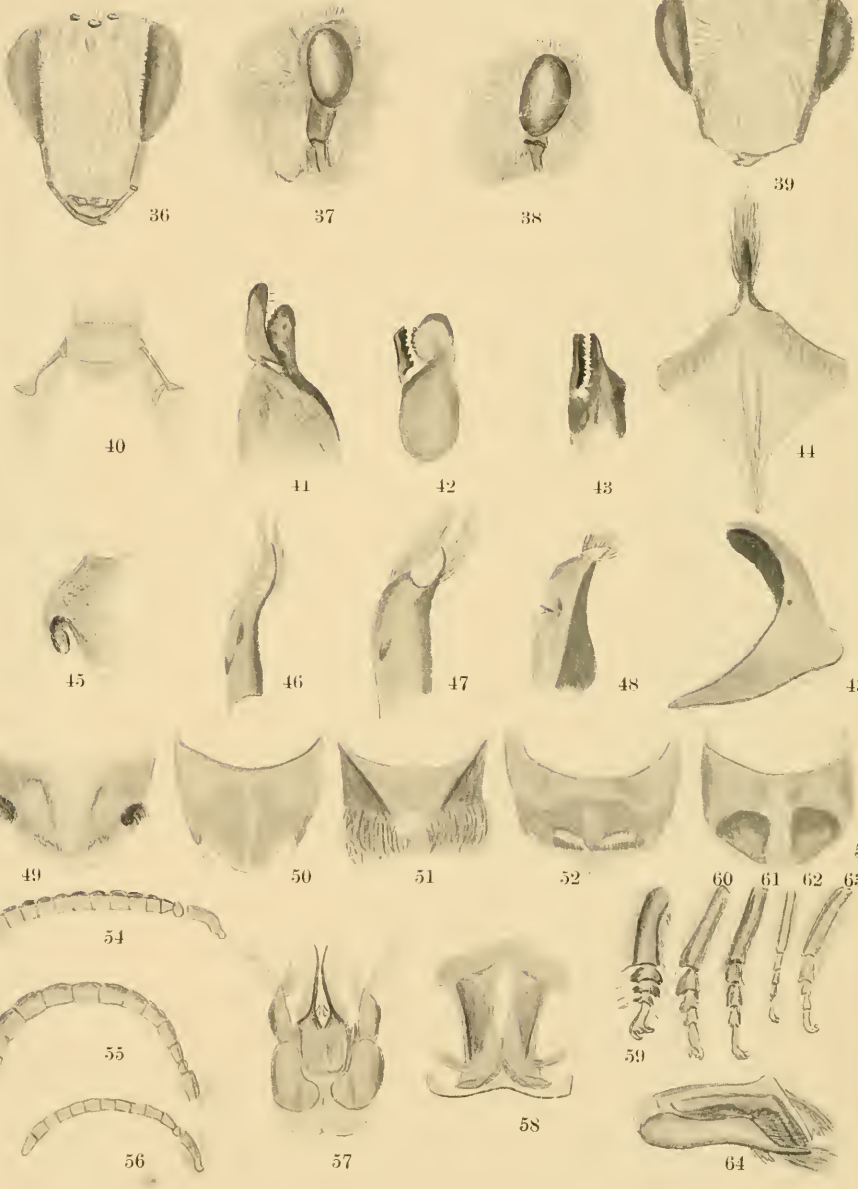

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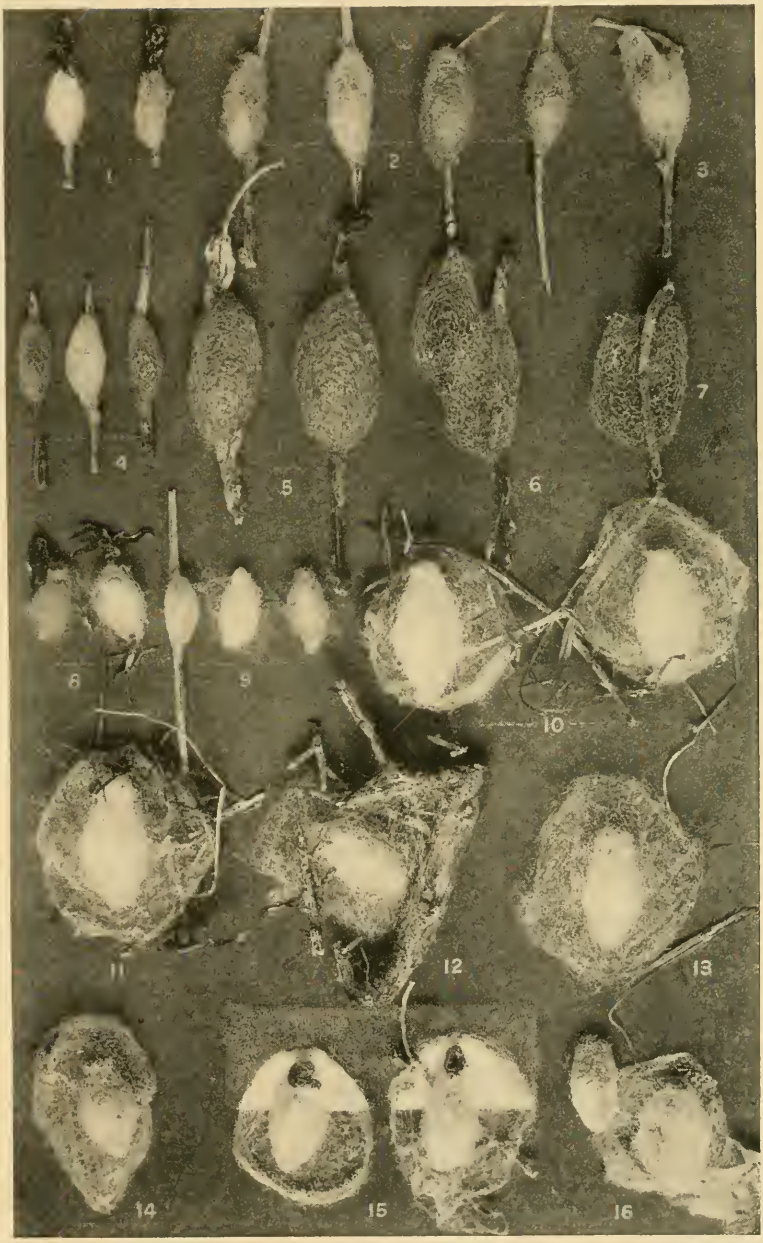
Male Terminal Segments and Armatures in Species of the Hymenopterous Genus Colletes.

R.E. Mintern del et lith.

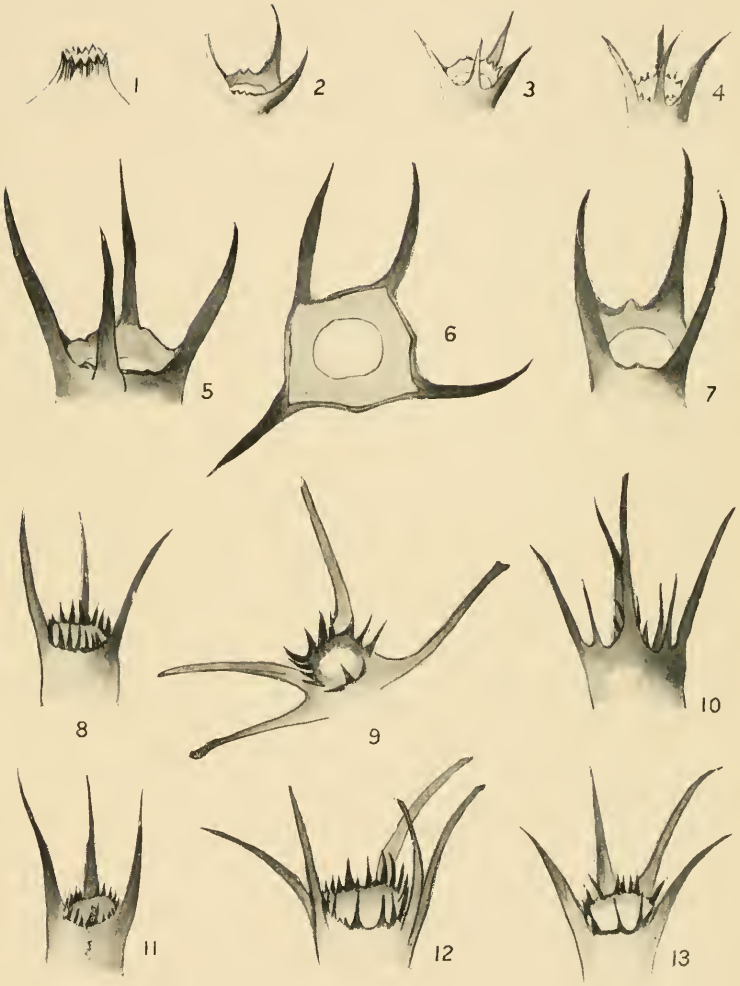
Mintern Bros. Chromo

Aberrations of Lepidoptera.



West, Newman photo.

HETEROGYNIS COCOONS.



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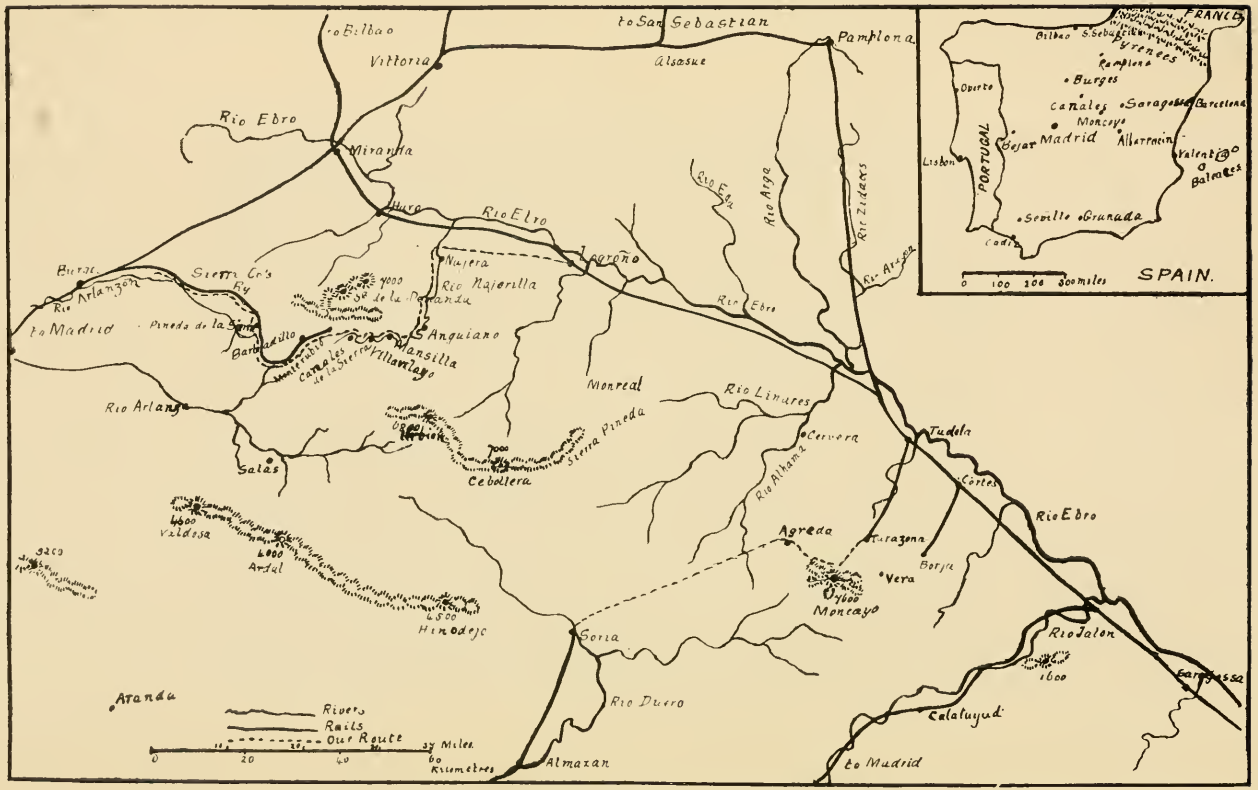
HETEROGYNIS LARVÆ.

Coronetted Tubercles.

Canales de la Sierra.
Province of Logroño.
from W.-N.-W.



ROUGH SKETCH MAP TO SHOW THE POSITION OF CANALES AND MONCAYO.

Slope of Moncayo, Aragon, with the
Santuario de Moncayo
from the east.

Horace Knight, del.

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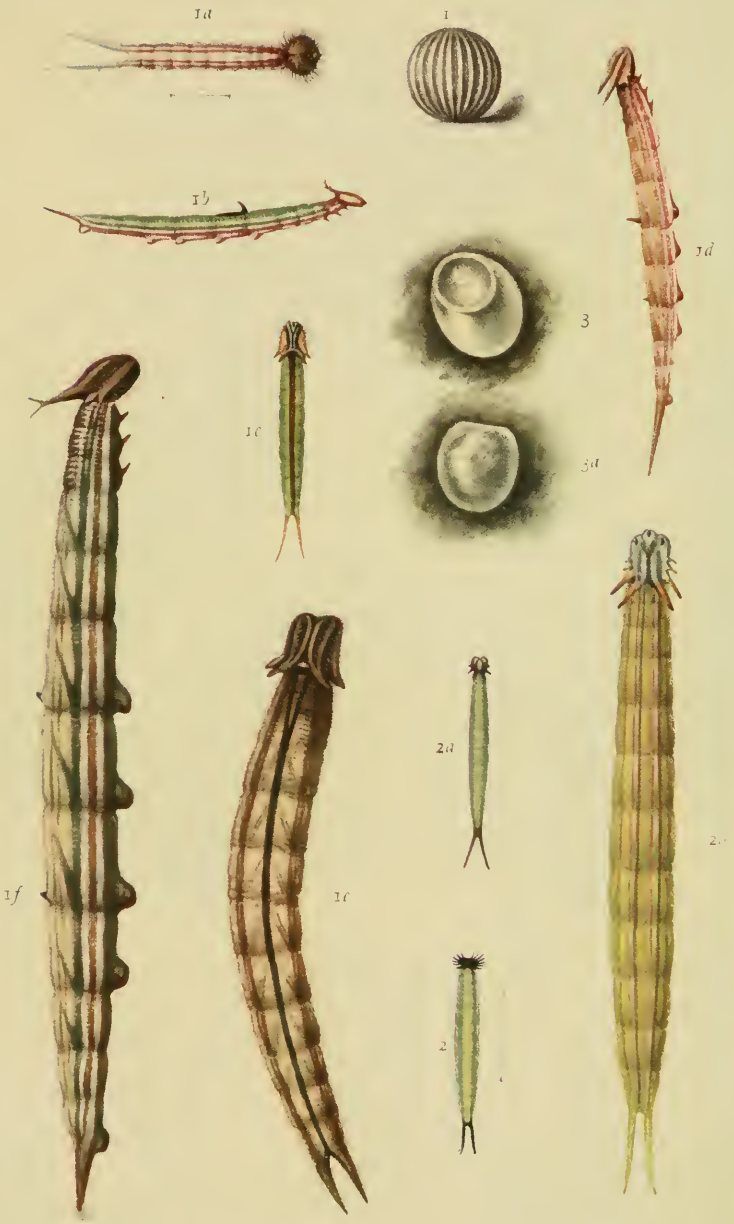
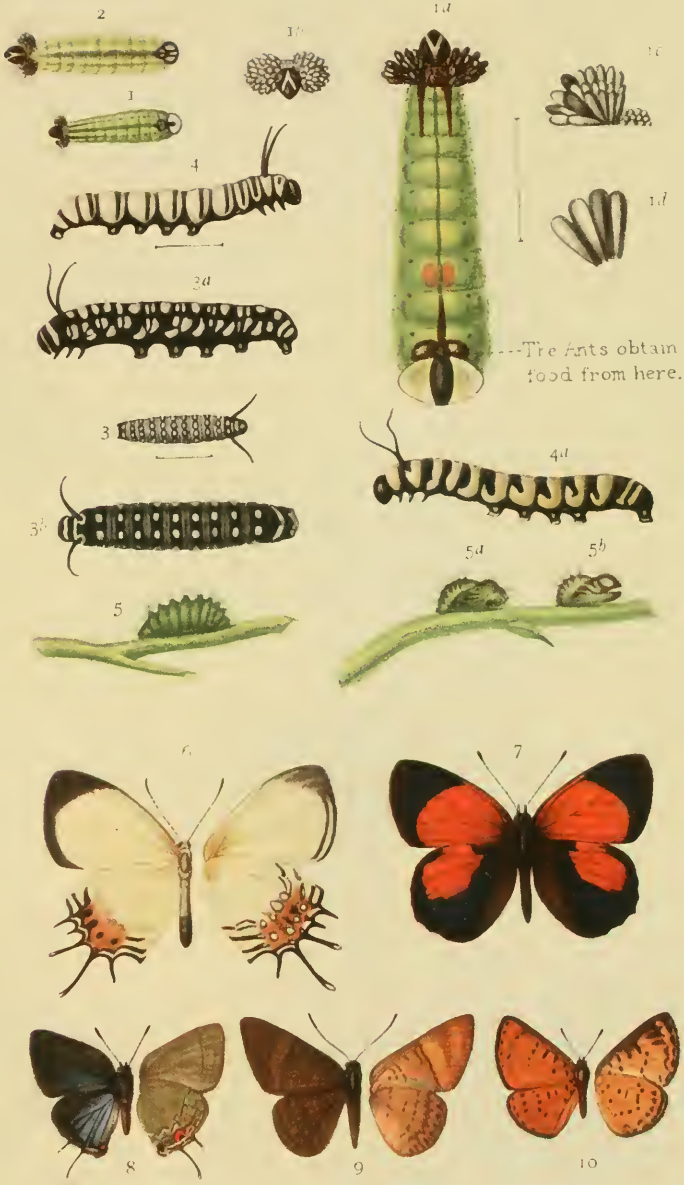
Pyropsyche moncaunella. Chapm.



Horace Knight. Hentschel-Colour type.

Ova and Larvae of Trinidad Butterflies.



HORACE KNIGHT. HENTSCHEL-COLOURTYPE.

Larvae, Pupae and Imagines of Trinidad Butterflies.

Horace Knight del.

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SOUTH-AFRICAN BUTTERFLIES.

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SOUTH-AFRICAN BUTTERFLIES.

West, Newman lith. London.

European Hydroptilidæ.

A. H. Lea, del. Bale & Danielsson Ltd. lith.

Australian Cryptocephalidæ.

A.M. Lea, del.

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Australian Cryptocephalidæ.

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Australian Cryptocephalidæ.

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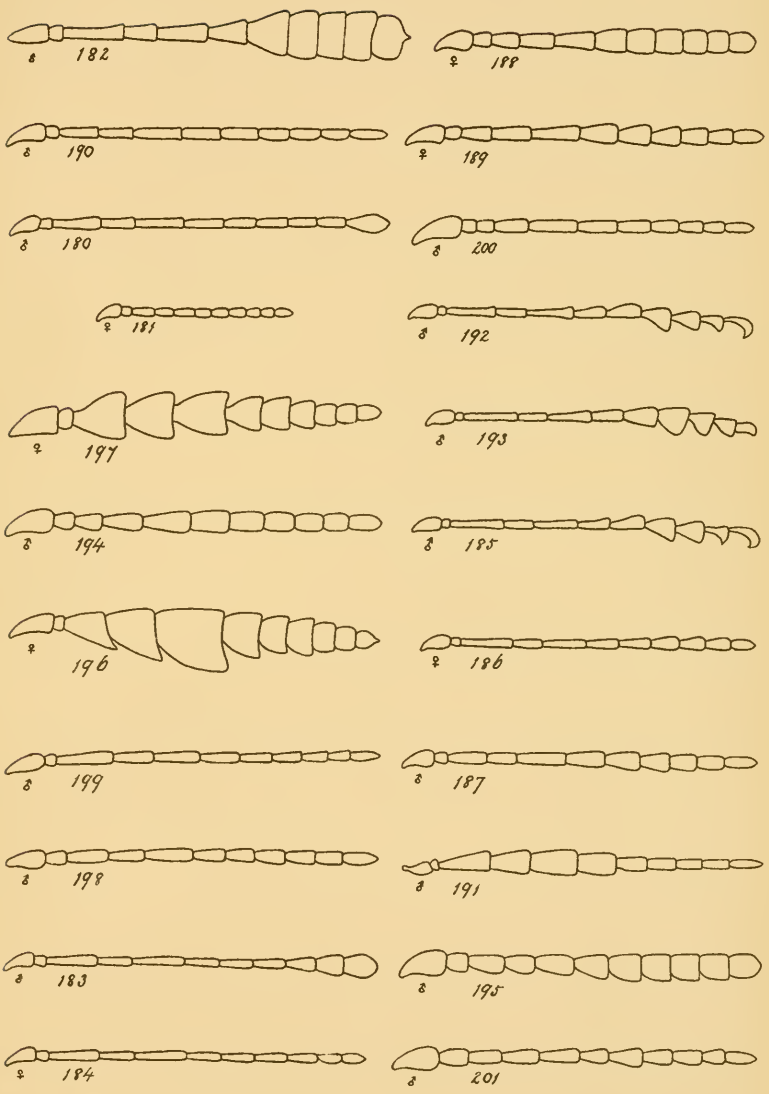
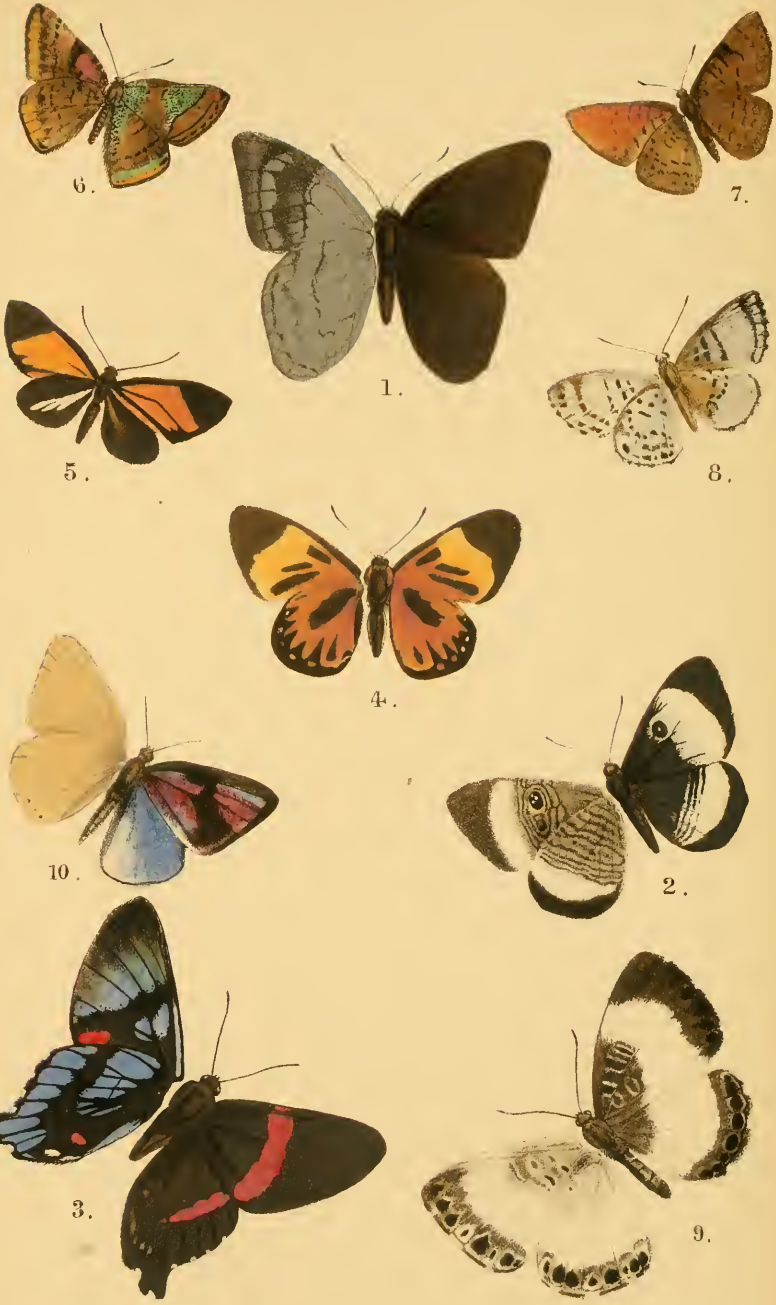
Australian Cryptocephalidæ.



A.M. Lea, del. Bale & Danielsson L.td lith.

Australian Cryptocephalidæ.



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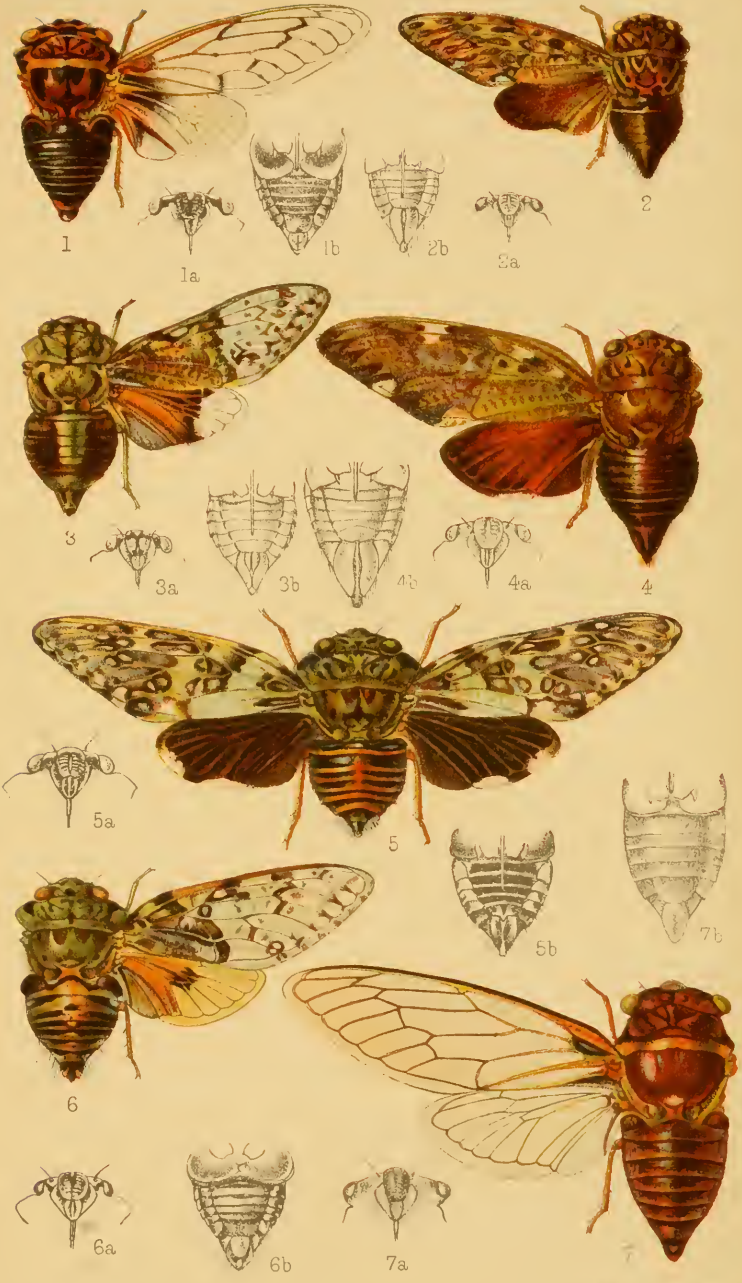
Mintern Bros. Chromo

New Species of Erycinidæ.

Andre & Sleigh. Ltd.

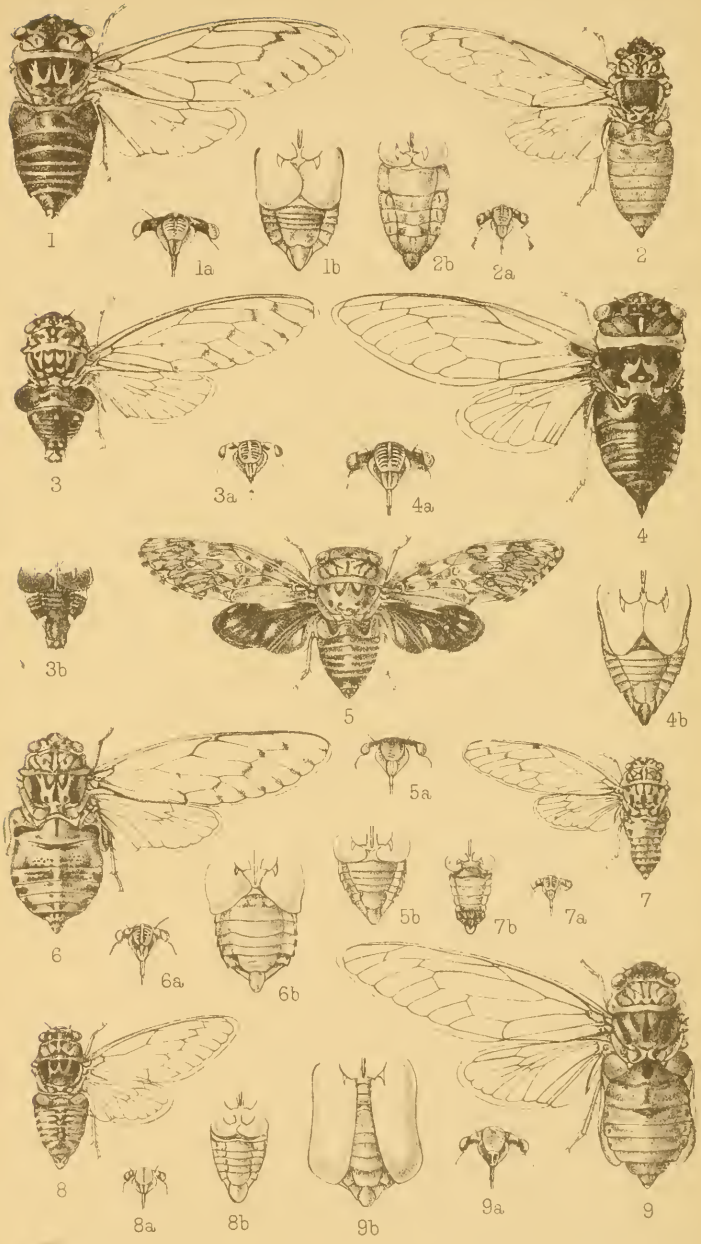
TECTORIS LINEOLA, F., VAR. BANKSI, DON.



Horace Knight del. et lith.

West, Newman & Co

EXOTIC CICADIDÆ.



Horace Knight del et lith.

West, Newman imp.

EXOTIC CICADIDÆ.

PARENTS AND REPRESENTATIVES OF ♀ OFFSPRING IN 1902 GROUP.

ENTIRE 1903 GROUP.

Alfred Robinson, phot. *Andre & Sleigh, Ltd.*

All the figures are slightly more than half the natural size.

Forms of *Papilio cenea* bred in 1902 from a *cenea* form of female, and in 1903 from a *trophonius* form of female.

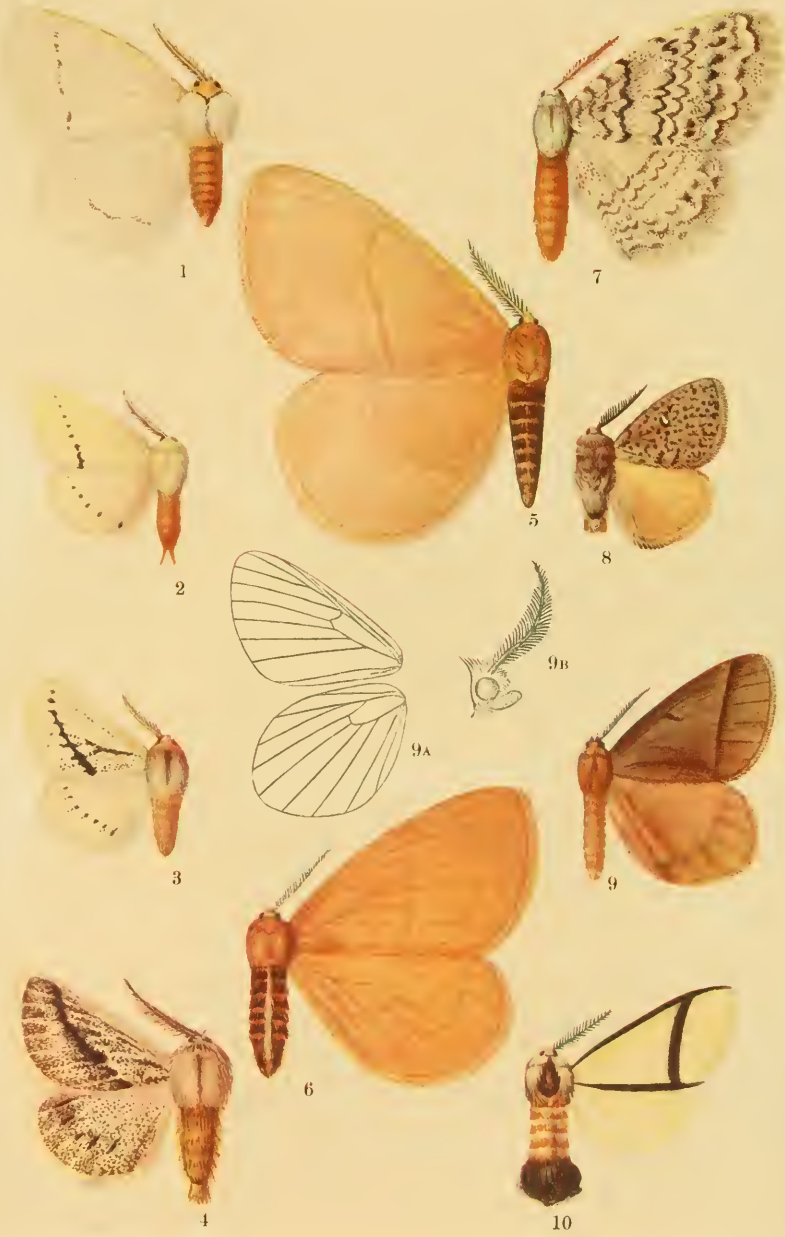
Durban, Natal.

Alfred Robinson, phot. *Andre & Sleigh, Ltd.*

All the figures are nearly $\frac{4}{5}$ of the natural size.

Hypolimnas misippus, ♀, var., together with representatives of the offspring reared from its eggs.

Durban, Natal, 1904.



Horace Knight del.

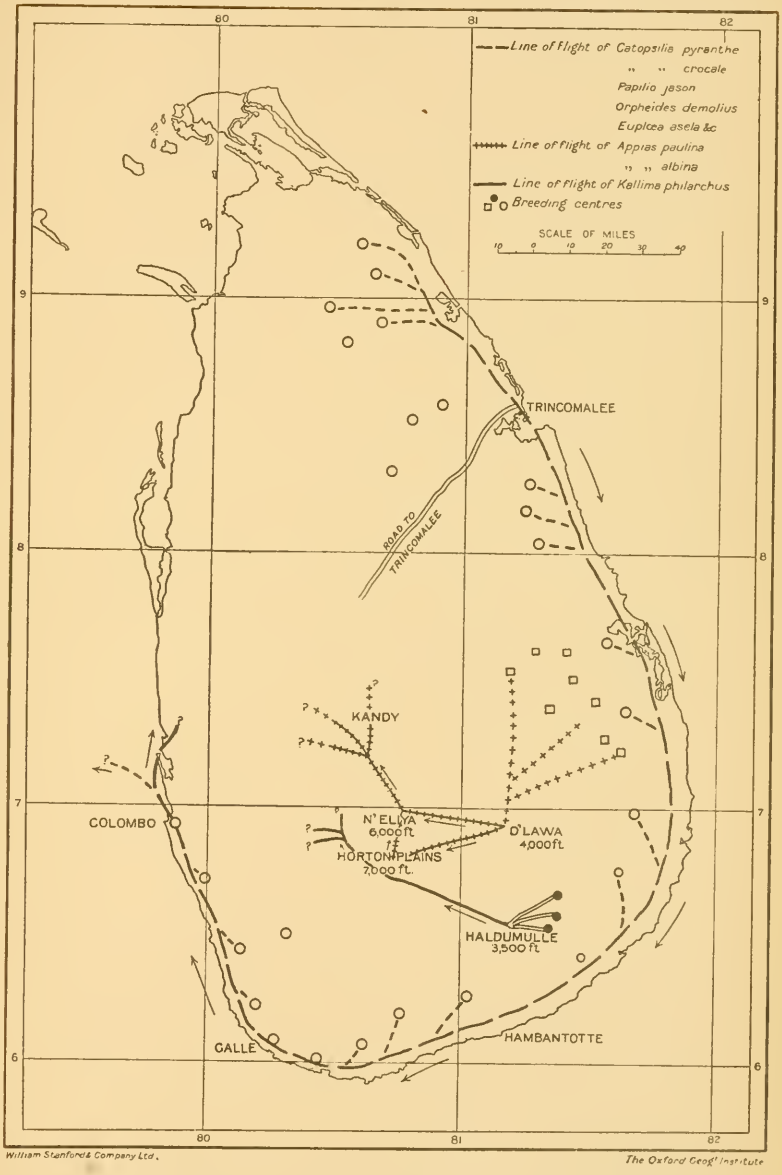
Andre & Sleigh Ltd

NEW AFRICAN MOTHS.

Alfred Robinson, photo. *Andre & Sleigh, Ltd.*

All the figures are about ⅔ of the natural size.

Experiments in breeding *Catopsilia pyranthe,* Linn.



MIGRATION OF BUTTERFLIES IN CEYLON.

Horace Knight del. West, Newman proc.

Vocal Organs of Lamellicorn Beetles.

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